AUTOMOTIVE INDUSTRIES

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JULY 31, 1937

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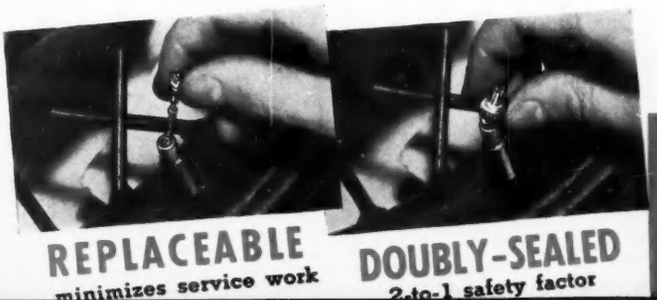

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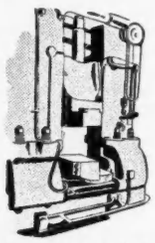

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Published Weekly

Volume 77 Number 5

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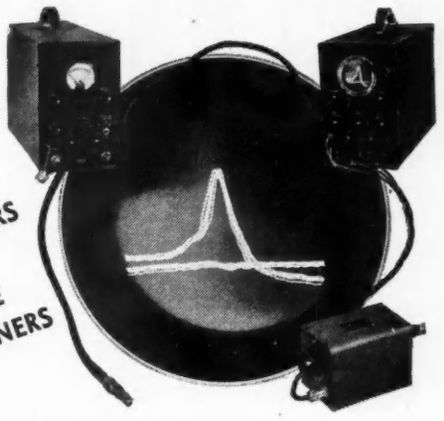

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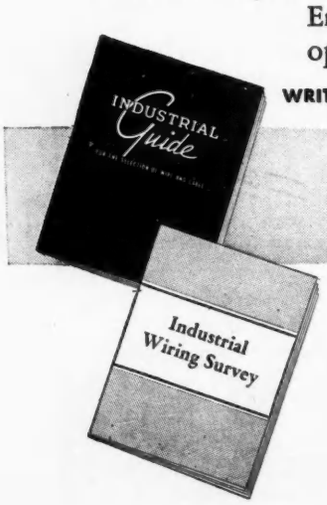

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AUTOMOTIVE INDUSTRIES

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GM Earnings Drop Laid to UAW

Sloan Assails Union for Inability to Prevent Stoppages Despite Agreement; Says Car Price Rise Necessary

General Motors Corp. divisions had only ten days of uninterrupted work from Feb. 11, the date an agreement was signed with the United Automobile Workers, through the June quarter, stated Alfred P. Sloan, Jr., chairman of the board, bitterly assailing the union for its inability to prevent wildcat strikes. He blamed the union for a decline in earnings during the second quarter compared with the like quarter of 1936. He said the company was unable to meet the demand for its cars because of interference with production. Demand currently is equal to the company's ability to supply.

Indirectly, labor troubles had another effect upon earnings, Mr. Sloan pointed out. Net income declined in relation to unit and dollar sales volume as a result of two general wage increases, numerous adjustments, and the need for using high-cost night shift operatives in an effort to make up production deficiencies. Earnings were also affected by higher materials costs. High car prices for 1938 will result, he forecasts.

Net income for the June quarter was $65,731,100, equal after preferred dividend provisions to $1.48 per common share. This compared with net income of $88,108,372 or $2.00 a share for the second quarter of 1936. In the 1937 period there was included a non-operating profit of $1,473,079 realized on the sale of securities. Mr. Sloan pointed out that unit sales dropped only 1.8 per cent and that dollar sales volume was up 7.4 per cent. The decline in net income was 26 per cent. Net sales to the public were $500,412,848 against $466,114,437 for the 1936 quarter-year.

The earnings for the June quarter brought net for the first half of the year up to $2.47 per common share against $3.17 for the first half of 1936. No provision for surtax on undistributed profits was made. Equities in undistributed profits or losses of non-consolidated subsidiaries were included.

Reflection of a higher rate of production at the close of June than a year earlier, due to the company's struggle to make up lost production, was seen in the inventory position. Inventories were $245,071,483 on June 30 against $166,432,106 a year before, and against $225,644,813 on Dec. 31, 1936. Cash was $170,347,061 against $290,591,894 a year earlier and against $188,559,023 on Dec. 31. Holdings of U. S. Government securities rose sharply to $89,647,561 on June 30 from $12,592,482 a year before, and from $4,998,667 on Dec. 31. Net trade receivables were also higher but the gain was more in line with the scope of operations. Trade receivables stood at $72,065,039 on June 30. Net working capital on June 30 was $407,984,895 against $388,890,622 on June 30, 1936, and against $339,686,551 on Dec. 31, 1936.

The company's share in the undivided profits of non-consolidated subsidiaries was $3,872,152 for the quarter, against $5,143,988 last year.

The report showed an increase in the company's holdings of its own stock from a valuation of $17,198,038 in June, 1936, to $22,575,116 this year.

Mr. Sloan's comment on the union's inability to control its members was: "Whatever the cause may be, the facts demonstrate beyond any reasonable doubt the worthlessness of an agreement if the procedure created to stop strikes is ignored and wildcat or unauthorized strikes result. It cannot be said that so far the United Automobile Workers of America have proven themselves to be a responsible body, with ability to live up to their contractual obligations. Manifestly, neither industry in general, nor General Motors in particular, can be expected to long

(Turn to page 142, please)

Shortages of Some Cars Seen Possible Later

Retail sales of motor vehicles are now running in excess of production, with field stocks rapidly declining. The process of liquidating dealer inventories usually gets under way after July 4 and this year, with early closing of some plants, it is already well along. Good sized dents have been made by some companies in their field stocks and it is not improbable that a scarcity will develop in some quarters before 1938 models can be put on the market. At this stage, factories are unable to stretch out their 1937 runs since commitments for materials have all been made.

Several companies are down already for model changes, but some of the larger plants have still thousands of cars scheduled. Plants affected earlier this year by labor troubles are finally catching up now.

Car Field Stocks Dwindling

Industry in Unusually Favorable Position as Model Run Draws Near End and Now Expects to Clean Out All 1937s

The industry is in an unusually favorable position this year as it approaches the end of the model season. In the past it has frequently found itself with big stocks in the field that had to be liquidated, often at a sacrifice. Factory price cuts would be made or rebates given dealers to be used in making big allowances on cars traded in. The result was a piling up of used cars on dealers' lots at unfavorable prices and a sacrifice of profits all around.

This year the industry is relatively in a sellers' market. Fall prices will be higher. Instead of a burden to dealers, unsold 1937 models should prove to be attractive merchandise to have on hand. Price cuts or over-allowances, generally speaking, will not be necessary. There may be certain instances where long trades will be made but on the whole, the balance of 1937 model production is expected to be moved without difficulty.

This does not mean that sales efforts will be relaxed. The aim is to clear the shelves as quickly as possible of outgoing models and concentrate on a cleanup of used cars so as to have the decks cleared for action when the 1938 campaign is launched. With smaller new car stocks on hand than a year ago and with used cars taken in on a favorable basis, dealers are expected to be in a good position for the start of the new model year.

Although there was a scant 10 per cent increase in field stocks of passenger cars during June, the dealers on July 1 held 12.3 per cent fewer new cars than a year ago. Used car stocks showed an opposite trend, down 9.7 per cent from the preceding month but they were 16 per cent higher than a year ago. There is, however, a substantial increase in the demand for used cars this year so that on the whole the turnover is better than last year and the higher stocks a matter of less concern than they were then.—H.E.G.

(Turn to page 142, please)

Discord May Flare at UAW Meeting

Disciplinary Action Taken to Prevent "Wildcat Strikes" Expected to Bring Battle on Convention Floor

Developments in connection with the disciplinary action taken by the executive board of the UAW in its efforts to eliminate outlaw strikes reveal discord in the union ranks that presages a hot battle on the floor of the convention in Milwaukee starting Aug. 23.

Most recent incident was the action of the Briggs local which has voted to suspend its president, Ralph Knox and vice-president Cecil Comstock, has authorized the hiring of Emil Mazey as local organizer and has called for a complete reorganization of the local. Mazey was one of the men ordered transferred by President Homer Martin in his disciplinary drive. He had just resigned as organizer for the international union at Briggs and was to be sent to Allentown, Pa. Knox and Comstock were said to be Martin supporters.

In Flint, supporters of Roy Reuther and Ralph Dale, organizers deposted by the international in the same disciplinary drive, indicated that the removals would be protested at the Milwaukee convention. These men, together with William Cody another organizer, had been ordered transferred from Flint after an investigation into the causes of outlaw strikes there, but the Flint Local No. 156 voted to retain them as local organizers. After their removal Reuther and Dale said they would remain in Flint as rank-and-file members pending the convention.

The case of Robert C. Travis, organization director in Flint who had been demoted by Martin, is also to come up before the convention. Travis to all appearances continues as "head man" at Flint and is popular in the local. Martin allowed him to remain in Flint as member of a five-man board in charge of organization work.

Although it has been officially denied, rumors persist of a widening breach between Martin and Wyndham Mortimer, first vice-president. Travis is a supporter of Mortimer, who is likely also to have the support of the Briggs local in view of the action taken last Sunday. Thus Martin may face formidable opposition to his reelection as president in Milwaukee, as the Flint and Briggs locals are probably the two largest in the union.

To Close Plant

Unable to meet the demands of the International Molders Union, the Albion Malleable Iron Co., Albion, Mich., decided to close its plant for an indefinite period. The union had voted 249 to 29 to strike if its demands were not met. It asked for an eight-hour day, 85 cents an hour minimum for molders, 60 cents for other workers and a closed shop. The plant, which employs 600 men, is being picketed.

Clayton & Lambert Mfg. Co., Detroit, resumed operations Tuesday morning after a sitdown strike had closed the plant on Monday afternoon. Strikers protested the discharge of two employes, UAW members, for slowing down production. About 350 of the 650 employes took part in the strike. Management agreed to rehire the two men on condition they maintain production standards.

The National Labor Relations Board has decided to hold a hearing in South Bend, Aug. 2, to determine wether company policemen of the Bendix Products corporation are eligible for participation in a union collective bargaining agency.

Leonard C. Bjork, regional director for the board, said that "the board felt it should go into this case because it would lay down a new principle."

The corporation, which has agreed to recognize Bendix local No. 9 as collective bargaining agent for the 4500 employes, has contended that company policemen should not participate in union bargaining because their duties in protecting company property might conflict with union objectives. The union has argued that all except supervisory employes should be represented by the UAW local.

Switches to AFL

The Chris-Craft Corp. of Algonac announces that an agreement for a closed shop has been signed with a Federal local of the American Federation of Labor to become effective Aug. 1, 1938, when an agreement it now has

(Turn to page 140, please)

Ford Probe Ending

Lindsay Gets Last Testimony; To Prepare Report

The NLRB hearings on charges of unfair labor practices against the Ford Motor Co. were in their closing stage as AUTOMOTIVE INDUSTRIES went to press. Louis J. Colombo, Ford counsel, expected to close his case, and other attorneys planned to complete their records by the end of the week after calling several rebuttal witnesses.

At one point, Trial Examiner John T. Lindsay explained that the conduct of the hearing was different from an ordinary lawsuit in that it was necessary to accept hearsay and irrelevant testimony to get all the facts, but that only relevant facts and true testimony would be considered in his decision. Lindsay will return to Washington at the conclusion of the trial to prepare his opinion for the board, after which announcement of his decision will be made.

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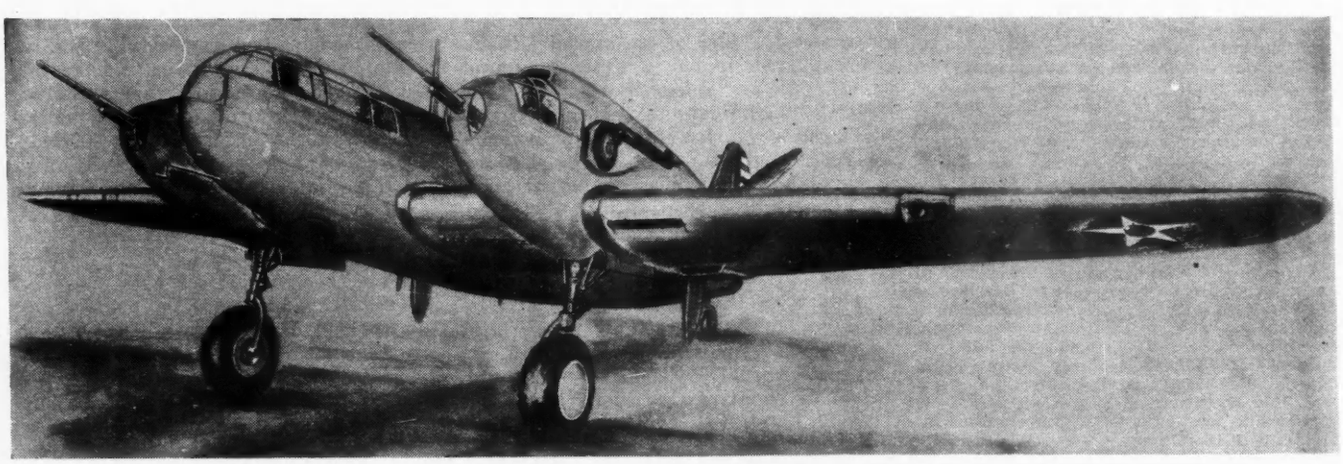


LIQUID-COOLED PUSHER type engines developed by Allison Engineering Co. are used in this new fighter just delivered to the Army by the Bell Aircraft Co. of Buffalo. The engines are rated at over 1000 hp. each. Two are used and are located in the wings, with extension shafts. the sealed-cooling system making the installation possible. The engines are V-12s and are cooled with ethylene-glycol. An auxiliary power plant develops electric power for operating retractable landing gear, lights, radio and starters. The plane, known as "XFM-1," is a low wing, all metal monoplane. Passageways permit exchange of crew locations.

Chrysler Workers Form An Association

Announcement was made this week of the organization of The Independent Association of Chrysler Employes which claims a membership of 26,000 Chrysler workers and is incorporated under Michigan laws. Initiation fee is 25 cents and monthly dues the same.

The association is the outgrowth of the dissatisfaction among workers with the UAW strike in Chrysler plants this spring and tactics employed by the union at that time. "The organization is not in any sense a company union, it is entirely independent, and we mean to keep it so," said Philip DiFalco, secretary of the Plymouth local. Earl L. Liddell is president. The new union has no intention of dealing with the Chrysler Corp. while its present contract exists with the UAW, it was stated.

GM-UAW Conferences Begin

General Motors officials entered into preliminary discussions with representatives of the United Automobile Workers on July 26 with a view to obtaining the guarantees that the union would live up to its contract requested by President W. S. Knudsen before the corporation would go ahead with any conference on new demands for changes in the existing contract.

The union was represented by its president, Homer Martin, First Vice-President Wyndham Mortimer and three members of the permanent bargaining committee on General Motors affairs. Representing the corporation were Floyd O. Tanner, vice-president in charge of industrial relations, and Harry W. Anderson of the industrial relations department, Vice-President C. E. Wilson and Stephen Dubrul, economist, also took part.

At request of the union, the preliminary conference was adjourned Tuesday afternoon until Thursday morning. No reason was given for the intermission but it is understood the union is working out a counter proposal to present to the corporation which it hopes will satisfy Mr. Knudsen's demand for guarantees against wild-cat strikes.

"As soon as a satisfactory clause has been agreed upon, the demands outlined in the union's letter of June 19 will be taken up," Mr. Knudsen stated.

Tire Output, Shipments Dip

Shipments of pneumatic casings during the month of May, estimated at 5,374,654 units, show a decrease of 3.3 per cent under April's 5,560,453 and were 7.9 per cent under shipments of 5,833,333 units made in May, 1936, according to statistics released by The Rubber Manufacturers Association, Inc.

This organization estimates production of pneumatic casings for May at 5,351,638 casings. This is a decrease of 6.6 per cent under the 5,729,869 in April but is 7.6 per cent above May, 1936, when 4,974,119 units were made.

Pneumatic casings in the hands of manufacturers May 31, 1937, are estimated at 12,592,215 units, a decrease of less than 1 per cent under the stocks on hand April 30 of 12,628,872 units and 54 per cent above stocks on hand May 31, 1936, which were 8,177,800 units.

Open FTC Parts Sales Probe

The Federal Trade Commission on Wednesday concluded three-day hearings in Detroit on the complaint of unfair dealer practices against General Motors Corp. and GM Sales Corp. and moved to Chicago for further hearings. After making the rounds of several cities, the hearings will again be resumed in Detroit, at which time General Motors will be given opportunity to present its defense.

The three-day session in Detroit this week was taken up with submission of a mass of documents called for by the commission from the various GM divisions. About 250 exhibits were brought in for identification and explanation and introduced into the record as evidence. These consisted of dealer contracts, letters of instruction from factory department heads to zone and district managers relative to the sale of parts and accessories, personnel lists of parts and accessory departments and zone maps of each GM division. Minor division officials were called in to answer questions as to methods of operation in connection with parts and accessory departments, how dealers were contacted, etc.

No dealers were called for testimony.

Ford Calls Situation "Mess"

Commenting on the business outlook, Henry Ford said, on his 74th birthday, July 23, "I have nothing but optimism for the future. I look forward to a great industrial year. The present mess will do more good to the country than most people expect." Explaining what he meant by "mess" Ford said: "I mean the mixing of backward politics, stupid business and labor exploitation that has been trying to hold up progress in this country.

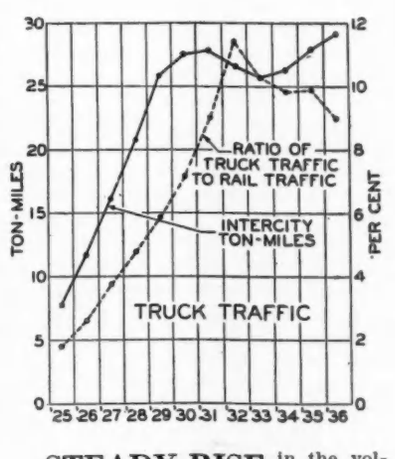
"I believe that a great many people have been put in their places—people who have been led into strikes. They believed in miracles and thought that things could be had by merely demanding them. But it will all work out.

"Improvements must be built—they cannot be talked into existence. Education will take care of that. People are learning by being disillusioned. False promises are failing and the people will iron out the problems."

NSPA Index Drops in June

The automotive sales index of the National Standard Parts Association dropped from 159 in May to 154 in June, but was still above the 152 level recorded in June, 1936. For six months the index stands at 147 against 134. All comparisons were set against average monthly sales in 1934 as 100.

Replacement parts shipped to wholesalers stood at 128 for June against 127 in May and 148 a year ago. Service equipment and tools shipped to wholesalers stood at 176 against 160 in May and against 143 last year. Original equipment shipped to vehicle manufacturers dropped to 285 in June from 315 in May but were well over the June, 1936, mark of 174. Exports were 140 against 150 and against 95 a year ago.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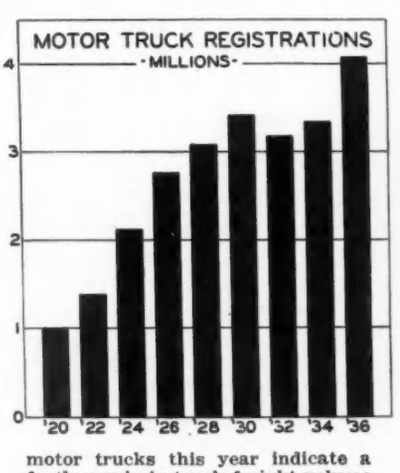


STEADY RISE in the volume of intercity ton-miles of freight moved by truck over the last twelve years, with only a moderate decline during the depression, is shown graphically in the publication *America's Transportation*. The curve of traffic movements has been closely followed by gains in truck registrations. Doubtless, record sales of motor trucks this year indicate a further gain in truck freight volume although many new truck sales have also been made to private fleet operators. The downswing in the ratio of truck traffic to rail traffic since 1931 probably reflects the revival of heavy goods shipments by rail and the institution of store-door delivery of less-than-carload freight by the railroads.

Finance Companies Tighten Up

Steps Are Taken Toward Elimination of Long Term Paper to Protect Buyer Against Interest Rise

Steps are being taken by leading finance companies to tighten up retail terms. There is little uniformity in the procedures but the trend is unmistakable. Even where finance companies have not adopted completely new schedules and are holding to a policy of adjusting terms to the car purchaser's wishes, the implication is that each deal is being scanned before it is taken.

One reason for the move is the desire on the part of the companies to protect themselves against a probable rise in interest rates. To buy much long term paper at present rates would work out badly if the companies had to borrow later at higher cost to carry it. The companies feel also, that with business recovery as far advanced as it is, there is no need to bolster public buying power by offering very easy terms. Long term financing of retail purchases, while it improves the public's ability to buy currently, costs the public more in finance charges, it is pointed out.

The National Association of Sales Finance Companies recently suggested the following as standard terms: New cars, maximum 18 months, minimum down payment 33 1/3 per cent; current model used cars, same; older used cars, maximum 12 months, minimum down payment 40 per cent.

With this as a guide, finance companies will probably gradually eliminate 24 month and so-called "$25 a month" plans, and will reduce all times to 18 months or less, excepting in special cases. Efforts will also be made to maintain the size of down payments.

Comment in some quarters indicates that in recent years it has been made too easy to buy a new car instead of a used car, and that this had been a contributing factor in raising the size of used car stocks in dealers hands.

Credit Losses Small

Commerce Department Finds Field Conditions Good

Credit conditions in the automobile field in 1936 were slightly improved over 1935 in a number of respects, and the industry's collections were again well ranked by comparison with other fields, according to a Department of Commerce survey entitled "Retail Credit Survey for 1936."

The average number of days open account credits were outstanding was reduced from 36 to 34 in the year, while automobile tire and accessory stores reported a reduction from 52 to 50 days. Excepting for the grocery and meat stores which collected in 41 days, these were the shortest periods reported. The average number of days in which instalment accounts were collected by automobile dealers rose from 227 to 229 days while tire and accessory stores cut the time from 93 to 84 days. Automobile dealers did 42.5 per cent of their business on an instalment basis, against 42.3 per cent in 1935. They did 36.4 per cent in cash against 36.2 in 1935, and did 21.1 per cent on open credit against 21.5 per cent in the preceding year. Automobile dealers had the same ratio of bad debt losses in each year on open credit, 0.5 per cent, while bad debt losses on installment sales dropped from 0.5 to 0.4 per cent. In the case of tire and accessory stores, open credit losses fell from 0.9 to 0.8 per cent but instalment losses on bad debts rose from 1.3 to 1.4 per cent.

A relatively small number of dealers reported instalment collection data because three-quarters of the dealers who did the business sold their paper to instalment finance companies.

The report also showed that dealers doing a business of between $250,000 and $500,000, one of the three largest reporting groups, had the largest total sales gain for the year, 40.1 per cent. Dealers doing a business up to $1,000,000 had sales gains of 19.8 per cent, and dealers doing over $1,000,000 gained 27.3 per cent. The only decline, that suffered by dealers doing between $50,000 and $100,000, was 38.1 per cent.

In the tire and accessory store field, open credit sales increased at the expense of cash sales, the two making up by far the bulk of the business. Open credit sales rose to 56.2 per cent of the total against 53.1 per cent in 1935. Cash sales fell from 44.2 to 41.5 per cent, and instalment sales fell from 2.7 to 2.3 per cent. Stores in the group doing $100,000 to $500,000 business had the larger gains in open credit sales.

GM Plant Safety Improves

General Motors Corporation reported the best sustained plant safety record in its history, with a mark of only 4.56 accidents per million hours worked, resulting in only .511 days lost for each thousand hours worked.

This record was made during the seven months' period between December 1, 1936 and June 30, 1937, when a corporation-wide safety contest sponsored by Alfred P. Sloan, Jr., chairman of the board, was staged among 77 plants in the United States and Canada.

The frequency rate is more than 80 per cent below that existing in General Motors plants in 1928, and reflects the constant efforts of the corporation in the field of safety education and the provision of safety devices, according to General Motors officials. Along with the decline in the number of accidents has come a marked reduction in the severity rate. In 1928, this rate was 1.025 days lost per 1,000 hours of work. In 1936, this rate had dropped to .664 and during the "Sloan Award" contest, it showed a further decline to .511.

Buyer Psychology Now Better

End of Court Fight, Relief from Pressure of Widespread Labor Disturbances Held Basis of Good Summer Car Sales

Psychological unrest, combined with an actual loss of purchasing power due to the strikes in various industries this year, can probably be blamed more than anything else for the failure of automobile sales to set new records in May and June. The first factor appears now on the wane, the second is less important than it was a month ago. It is deemed probable that summer sales of 1937 cars are reflecting the change, and that fall sales of new cars may also be highly satisfactory.

In the psychological picture were a number of things. The man on the street and the managers of industry and finance were both very deeply concerned with the proposals to "pack" the Supreme Court. They said so. In their communications to Congress, which played a large part in influencing Senators against the court bill, and in their conversational reactions, they indicated very strongly that passage of the bill would undermine business confidence. Even so, that confidence was badly shaken and is only now recovering. The extent of the direct effect upon business broadly and upon automobile sales specifically can never be determined, but it could not but have been profound.

So far as the labor aspect is concerned, the number of new and used car sales that were lost because plant workers in various fields were stirred into a ferment was doubtless large. When men are on strike they do not spend money for automobiles. And when men know they may soon be out of work due to plant closures they are naturally hesitant to risk their funds.

The strikes themselves cut off the current income of the workers. Very few of the strikers have enough in reserve to buy cars when they are not working and earning. The influence of a strike spreads rapidly. Automotive suppliers curtail operations when the automobile plants are closed. Very few workers in suppliers' factories are able, or care to buy cars when they do not know how long the curtailment of their income will last.

On the positive side of the picture is the major factor this year of the prom-

ise of excellent crops. Already there have been reports of a wave of farmer buying of new cars. For several seasons cars have been hard-used, and in the dusty areas many an engine has been ruined. Persons in touch with agricultural areas say that farmers are not "broke" excepting the relatively small number in the very worst sections of drought-struck country. Some proof of the bank balances, and credit, of the farmers is seen in the surge of farm equipment buying this year.

Involved also in this summer's automobile business is the buyers' thought that next year's cars will be higher priced and not so very much different from the 1937 models. That is a good reason for buying now, particularly if the buyer has the funds, or promise of the funds upon sale of a good crop, or if the buyer's resources were not too seriously depleted while he was out of work, on strike himself or thrown out of work when some other plant was closed.

Fuels to Change

ASTM Head Shows Effect of Wide Diesel Use

Development of the Diesel engine into a light, mobile form will probably change the trend of oil refinery operations from one aimed at the complete conversion of volatile liquids and heavy petroleum into gasoline to one aimed at greater production of heavier oils, according to A. C. Fieldner, president of the American Society for Testing Materials, addressing the annual meeting of the Society in New York recently.

The combination of the success of the Diesel engine, due in part to the fact that it can use the heavier fractions now employed as cracking stock for gasoline, together with the improving efficiency of refinery operations, should go far to allay fears of a motor fuel shortage by 1945, Mr. Fieldner indicated.

Mr. Fieldner said that new methods of extracting oil from its bearing sands, catalytic polymerization and hydrogenation eventually will permit complete conversion of heavy petroleum into gasoline should this be desirable. He remarked that since three times the mileage should be obtained from a gallon of crude oil used for Diesel fuel than is obtained by conversion into gasoline, it will probably not happen that complete conversions will be widely carried out.

New Modern Grinder Plant

Modern Grinder Mfg. Co., Milwaukee, manufacturing hydraulic lifting jacks in addition to manual and power tool grinders and other garage and machine shop specialties, is establishing a new plant in Fond du Lac, Wis., at Brooke Street and Forest Avenue, with a payroll of 100, to be increased by 50 workers by the end of this year. E. H. Bockshe is president and treasurer.

Now It Can Be Told . . .

Knudsen Gives Editors His Reactions on NRA

The automobile industry took a new lease on life after the filing of the Henderson report on its activities, made under the NRA, and began to think it was not so bad as it was painted, said William S. Knudsen, president of General Motors, reminiscing in an address to the National Editorial Association at a meeting of the association at the Pontiac Motor plant.

Mr. Knudsen gave the meeting his personal reaction on the activities of the NRA. He said:

"When the NRA entered the picture, somebody suddenly was pointing their finger at us and saying 'You are bad.' Nobody had done that before; consequently, we were a little surprised, and began to think maybe we were bad. We were called down to Washington and told to do so and so. On top of that, a man was sent out to go through our plants—Mr. Henderson. He went through our plant, that is, he didn't, but he had an assistant go through. This fellow had never been in the motor car business before, and had never been in a motor car factory of any sort. He was a little rusty on the mechanics of the thing. When we got all through, he made a report which accused us of everything but plain murder. Now you know there is such a thing as someone talking a little too plainly—you begin to wonder whether you are really as bad as that. I think the automobile industry, after the Henderson report, took a new lease on life, and began to think they were not as bad as they thought they were."

Later in his address Mr. Knudsen, commenting on the events that took place during the strike this year, remarked that General Motors found it had very few, if any, rights at that time. "You want to be sure you don't get mad in times like that, because it isn't going to do you any good," he said, adding that every morning he "had two bunches of letters on my desk —one saying 'you are terrible' and the other saying 'you are fine'." Mr. Knudsen commented that everybody in the country was "in on that strike."

He said the present agreement with the UAW "wasn't a very good agreement but I still have hopes. The specific gravity of this movement will find its own level through public opinion, because that is the only thing that matters, after all."

June Car Sales Down

Estimate by R. L. Polk & Co. places the figure for the total passenger car sales in June at 325,000.

June registrations for nine states were reported to total 27,282. This is minus 16.74 per cent compared with the previous month's figure for the same number of states and minus 13.13 per cent compared to nine states in June, 1936.

On the basis of nine states reporting, 60,000 truck and commercial car sales in June are listed. Total sales are reported by the nine states at 5694. The figure is minus 12.25 per cent compared to the same number of states reporting in May, but is 4.84 per cent ahead of the figure reported by the same states June a year ago.

VARIETY

Forecasts Automotive Radio Plans for This Fall

A considerable amount of automotive and allied-field radio advertising is to be done this Fall, according to a poll of advertising agencies by the magazine *Variety*. Major companies to be on the air include several large automobile manufacturers and oil companies. Accessory makers and dealer organizations are also scheduled for local radio time.

Agencies in many cities are represented in the group which replied to the magazine's query.

Following in alphabetical order are replies from advertising agencies telling of their radio plans:

N. W. Ayer & Son: **Ford** dealers' "Watch the Fun Go By" will apparently continue without change. **Ford** Sunday Evening Hour will resume, beginning Sept. 12, along previous lines. **Ford** "Universal Rhythm" program, now filling a Sunday evening spot, will go to a Saturday 9:30 to 10 spot. **Atlantic Refining** will sponsor an extensive list of football games, reported the agency's Prentice Winchell.

Campbell-Ewald: **General Motors** Concerts go on. Radio plans somewhat uncertain because of labor situation, according to Louis Dean.

J. Stirling Getchell: Now running and expected to continue through Fall are **Socony - Vacuum** news broadcasts 3 times per day, said the agency's Prentice Winchell.

Lord & Thomas: What's specific at this date includes **Union Oil** and **Associated Oil** in California. Indications are for a big radio year in every respect, reported Tom McAvity of the agency.

McCann-Erickson: Represented in the agency's spot department for Fall going is **Ford Motors.**

Lennon & Mitchell: **Tidewater Oil** will sponsor 15 or 20 various local programs (mostly news or sports) in the east.

Ruthrauff & Ryan: Tentative schedule of network and spot programs includes Major Bowes continuing for **Chrysler** over CBS Thursdays at 9 P.M. and Frank Morgan transcriptions for **Dodge-Chrysler,** wrote Heagan Bayes answering the query.

Schwimmer & Scott: **Studebaker Sales Co.** will continue six 15 minute periods a week featuring a musical show, said Walter Schwimmer.

Young & Rubicam: **Packard,** 9:30 P.M., EST, Tuesdays starting Sept. 7 on the Red NBC coast to coast originating from Hollywood. Type of show not decided upon as yet. Lanny Ross will be present. **Gulf** starring Phil Baker, with Beetle and Bottle and Oscar Bradley's orchestra, originating from New York City, CBS Sunday night from 7:30 to 8. Broadcast over 60 stations, beginning Oct. 3 and ending June 26, 1938, reports Tom Barton.

Ford Probe Ending

(Continued from page 136)

A sharp altercation between Louis J. Colombo, Ford attorney, and trial examiner John T. Lindsay enlivened the NLRB hearings Tuesday on charges of unfair labor practices by the Ford Motor Co. Colombo shouted in a loud voice that he was being "treated like a horse-thief rather than an officer of a court of justice" when Lindsay overruled his objection to questions put by NLRB counsel Laurence Knapp to witness Dennis McKinney, a general foreman of the Ford Highland Park plant.

R. L. MORRISON has been named general manager of the Bendix-Westinghouse Automotive Air Brake Company at Pittsburgh. The appointment was announced by S. G. Down, executive vice president of the company, which is a mutual subsidiary of the Westinghouse Air Brake Company and the Bendix Aviation Corporation.

CHESTER T. MORLEDGE has been named assistant manager of The B. F. Goodrich Company automobile tire department, it is announced by W. C. Behoteguy, tire sales department head.

ALEX TAUB, formerly Chevrolet engine specialist and now attached to the Vauxhall development laboratory in England, is visiting in Detroit for several weeks on a combination vacation and business trip.

A. R. BOSCOW, advertising and sales executive, has been appointed to fill the newly created post of director of advertising and merchandising of the Nash Motors division of Nash-Kelvinator Corporation, it was announced by C. H. Bliss, vice-president and director of sales.

FRANK E. PHILLIPS, export sales manager of the Gemmer Mfg. Co., has gone abroad to spend a month or six weeks in England and on the Continent visiting automobile centers in the interest of the company.

CLARENCE G. FOX has taken up duties as purchasing agent of the Marvel-Schebler Carbureter Div. of Borg-Warner Corp.

Knapp was cross-examining McKinney on reasons for discharging a union man named in the Labor Board's complaint.

Colombo complained that Knapp was abusing the witness, "and the witness is getting no protection whatever from the examiner." He charged the Labor Board attorney with brow-beating the witness by reminding him of the perjury statute.

Lindsay, who has overruled most of Colombo's objections, snapped out: "This has gone far enough. Bull-dozing won't get you to first base." He ordered a remark by Colombo about "there must be some rule of fairness in this" be stricken from the record.

Several foremen on the stand testified that the discharged men were fired because of poor workmanship or slowing down their work. Richard Elberth, a general foreman at the Rouge plant, declared that he was told that John T. McTernan, board attorney, had threatened to make a "jackass on the stand" out of an assistant foreman if he failed to make a statement to the board. Foreman McKinney had testified that there had been sabotage at the Ford plant. "I couldn't help but have the impression that there were men in the varnish room who were not working in the interest of the Ford Motor Co.," he declared. "We would get whole tank cars of frame paint that would not dry."

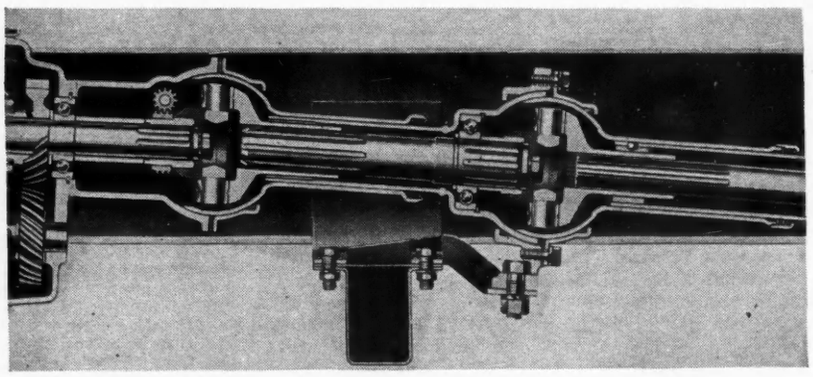
Discord May Flare

(Continued from page 136)

with the CIO expires. Action was taken after a check of the membership of the AFL local disclosed that it had a majority of the 700 employes, it was stated. The CIO agreement was made April 14 after the plant had been closed for 25 days by strike and lockout.

Von Delius Killed

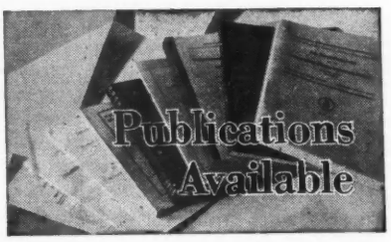
Cabled reports July 26 reported the death, due to injuries suffered in an automobile racing accident, of Ernst Von Delius who won fourth prize in the Vanderbilt Cup Race at Roosevelt Raceway, Westbury, L. I., on July 5. His car skidded and went off the track. Von Delius was thrown clear but died the following day.



WHIPLESS propeller shafts in the new Chevrolet ¾ and one ton truck models are said by the manufacturer to result from the incorporation in the intermediate drive of coupling shafts. Two universal joints are separated as shown, permitting use of shorter propeller shafts and torque tubes to the rear axle.

Chevrolet's Millionth Out

The millionth 1937 model Chevrolet was completed at the company's Flint, Mich., assembly plant July 28, two weeks after production of the 13-millionth car since the founding of the company 25 years ago. It made 1937 the third successive year in which Chevrolet has produced more than one million units and the sixth time in the history of the company that more than one million cars of any one model have been built.



A **paper presented** at the annual meeting of the Pennsylvania Institute of Certified Public Accountants, entitled "The Accountant as a Member of a Profit-Earning Team," written by R. E. W. Harrison, of Clarke-Harrison, Inc., has been made available.*

Data on and uses of **silent chain drives** are detailed in a new booklet by the Morse Chain Co.*

A new **"Beetle Technical Book"** has just been issued by the Beetle Products division of the American Cyanamid Co. It is illustrated and contains full information on the product.*

Reprints of an address "What Is the Future of Private Enterprise" by D. D. Cohn, executive vice-president of the Transportation Association of America, are available.*

International Printing Ink Corp. has published a laboratory report covering the properties and applications of a new **blue pigment,** said to have automotive and other industrial uses.*

Commercial Investment Trust, Inc., has issued a pamphlet describing the applications of its industrial **equipment purchase financing** plan.*

A booklet, "Buried Treasure Check List," issued by the Acme Card System Co., describes the uses of its **visible record** equipment.*

Description of the **Servi-cycle** is contained in a leaflet issued by the Simplex Mfg. Corp., its producer.*

Applications of Rockwood single groove V-belts are detailed in a **catalog,** No. 795. Rockwood Mfg. Co. is the publisher.*

Vanadium-Alloys Steel Co. has issued a new **catalog** of Vascoloy-Ramet tools and blanks.*

Cash budget procedures of 45 companies are discussed in a booklet published by the policyholders service bureau of the Metropolitan Life Insurance Co.*

Radio station WOR has published a booklet breaking down listener reactions and preferences as to time and program.*

A catalog of **use data** on Celoron gears has been issued by Continental Diamond Fibre Co.*

B. F. Goodrich Co. has issued the 1937 edition of its "Operators Handbook." It contains data for all **rubber tire users.***

General Electric Co. has issued an **illus-**

trated booklet discussing installations of Diesel-electric locomotives.*

International Nickel Co., Inc., has published a booklet entitled "Heat Treatment Fundamentals."*

The Keller cutter and radius grinder is discussed in a descriptive circular published by Pratt & Whitney.*

A new catalog, No. 1060C, covering the complete line of temperature and pressure indicating, recording and controlling instruments made by the C. J. Tagliabue Mfg. Co. has been published.*

Chrysler to Pay $3.50

Earns $3.80 a Share in June Quarter; Costs Rise

Chrysler Corp. reported net income for the June quarter of $16,542,307 or $3.80 a share, against $18,020,298 or $4.18 a share for the second quarter of 1936. Directors at the meeting, July 23, declared a dividend of $3.50 a share payable Sept. 10 to stock of record Aug. 10. The dividend was 50 cents smaller than that declared a year ago, but aggregate dividends for this year have been $7 against $6.50 for the like part of 1936.

Net income for the half year was $27,456,609 or $6.31 a share against $29,473,737 or $6.83 a share for the first half of last year.

Sales for the second quarter were 226,480,909, a gain of 7.76 per cent over the 1936 quarter. Cost of sales was $193,215,360, a rise of 14.5 per cent. First quarter sales had gained 23.4 per cent and first quarter costs 26.6 per cent, indicating some change in the ratios due to labor costs, strike losses and increased materials costs.

Depreciation charges for the six months were $9,952,822 against $7,583,725 for last year.

Unit sales for the half year were 629,706 cars and trucks against 578,407 last year.

Cash holdings at June 30 were $73,145,076 against $46,551,621 on Dec. 31, 1936. With securities, the figure stood at $85,495,277 against $60,904,424 on Dec. 31. Inventories were $44,356,596 against $60,565,447 at the end of 1936. The change in cash and inventories is seasonal.

Studebaker Gains

Studebaker Corp. reported net income for the first half of the year of $1,174,518 or 54 cents a share on the 2,187,838 common shares, Paul G. Hoffman, president, announced. This compared with net income of $1,004,829 or 47 cents a share in the first half of 1936. June quarter net alone was $475,058 against $900,175 last year. Sales for the quarter were 30,293 cars and trucks valued at $22,216,310 including parts and accessories, against 26,394 valued at $19,422,067 for the June quarter of 1936. The balance sheet of June 30 showed current assets of $19,401,182 against current liabilities of $7,049,197. Cash was $8,912,616 and net inventories $8,079,702.

Tractor Exports in Wide Gain

Foreign sales during the January-April period of this year of tracklaying tractors reached a value of $5,526,512, or 92 per cent above the value of shipments during the same period of last year, amounting to $2,875,618, according to the machinery division, Department of Commerce.

Exports of the fuel injection type amounted to $3,495,377, a 98 per cent gain over the $1,762,019 worth shipped in January-April last year, and of the carburetor type, $2,031,135, an 82 per cent increase over the shipments a year ago valued at $1,113,599. In the fuel injection type, foreign sales increased most in the 35 to 59 drawbar horsepower sizes and represented 53 per cent of the total exports of this type compared with 25 per cent in the same period of last year. Substantially increased sales in this size range were made to France, Canada, Mexico, Australia, the Union of South Africa, Algeria, Tunisia, and Morocco.

As usual, most of the sales of the carburetor type tracklaying tractors consisted of the sizes under 35 drawbar horsepower, important gains being registered in the shipments to France, the United Kingdom, Canada, Mexico, Australia and other smaller markets, it was stated.

Wheel tractor exports during the period gained by 73 per cent to total $6,907,287 compared with $3,997,389 a year ago. Shipments abroad increased in all three size categories, but the greatest gains were made in the smaller and medium sizes. Exports in the 15 to 32 belt horsepower sizes gained by 102 per cent and represented 61 per cent of the total compared with 52 per cent a year ago. Greater sales were made to most of the foreign markets for this type of American equipment. Very large gains were also recorded in the sales to Mexico, Argentina, Brazil, and Australia in the 33 and over belt horsepower sizes of wheel tractors.

Comm'l Credit Sets Records

Commercial Credit Co. did a record volume of business in the first half of the year and reported the largest six months' net income in its history.

Net income for the period was $7,100,275, equal after preferred dividends to $3.71 per share on 1,841,740 common shares. This compared with $5,077,769 or $3.60 per share on 1,262,207 common shares in the like period of 1936. Receivables acquired during the six months amounted to $496,196,919 against $402,459,870 in the first half of last year. The earnings as stated did not include any appreciation of investments.

Road Surfacing Goes Ahead

State highway departments placed 28,913 miles of new highway surfacing in 1936, according to reports of State highway departments to the Bureau of Public Roads of the Department of Agriculture. The new surfaces consisted of 4,706 miles of high-type surfaces such as bituminous macadam, bituminous concrete, portland cement concrete, and brick and 24,207 miles of lower types of surfacing.

For every mile of surfacing placed on an earth road 2 miles of new surfacing was placed on old surfaced roads.

Company Earnings

Borg-Warner
6 mos. ended June 30

	1937	1936
Net Income	$4,304,299	$3,458,126
Per share	1.87X	2.94

X on split stock.

Cash and securities on June 30 $9,542,995, inventories $11,146,218 against $13,073,028 and $7,669,537 a year earlier.

Houdaille-Hershey
June quarter

Net Income	$1,020,467	$1,010,648
Per B share	1.16	1.15

Allis-Chalmers
June quarter

Net Income	$2,636,850	$1,334,473
Per share	1.49*	99c**

* on 1,772,157 shares.
** on 1,347,736 shares.

Unfilled orders June 30, $23,118,357 against $10,776,376 a year before.

Federal Motor Truck
6 mos. ended June 30

Net Income	$76,857T	$123,095

T Before taxes.

Hupp Motor Car Corp.
June quarter

Net Loss	$212,241	$213,586

Van Norman Machine Tool
24 weeks ended June 19

Net Income	$41,640	$155,729

Stewart-Warner
6 mos. ended June 30

Net Income	$1,541,920	$1,054,361
Per share	1.24	85c

Electric Auto-Lite
6 mos. ended June 30

	1937	1936
Net Income	$2,316,275†	$2,355,878
Per share	1.92	1.86

† Preferred stock retired; this sum after dividends on it to retirement date.

Evans Products
June quarter

Net Income	$57,868	$21,538
Per share	23c	9c

Bendix Aviation
June quarter

Net Income	$825,483	$1,008,740

Spicer Mfg.
June quarter

Net Income	$386,271	$387,936
Per share	1.11	1.11

Diamond T
June quarter

Net Income	$199,466	.....
Per share	50c	.....

Kelsey Hayes Wheel
June quarter

Net Income	$587,410	$622,278
Per share A & B	1.09	1.17

Motor Products
June quarter

Net Income	$751,405	$531,423
Per share	1.92	1.36

Federal Mogul
June quarter

Net Income	$160,084	$131,833
Per share	94c	85c

Business in Brief

Written by the Guaranty Trust Co., New York

Upturn Pronounced

After a sharp drop in the preceding week, general business activity registered a pronounced upturn last week. The weekly index compiled by the "Journal of Commerce" stood at 100.8, as compared with 93.3 the week before and 92.0 a year ago. The retail sales volume was estimated from 2 to 6 per cent above that in the preceding week and from 8 to 20 per cent above that in the corresponding period last year.

The Guaranty Trust Company's index of business activity for June stands at the preliminary figure of 95.3, as compared with 95.7 the month before and 85.4 a year ago. The company's index of wholesale commodity prices on July 15 was 87.5, as compared with 84.8 a month earlier and 67.7 a year ago.

Carloadings Rise

Railway freight loadings during the week ended July 17 totaled 770,075 cars, which marks an increase of 87,870 cars above those in the preceding week, a rise of 49,716 cars above those a year ago, and an upturn of 177,403 cars above those two years ago.

Production of electricity by the electric light and power industry in the United States during the week ended July 17 was 13.2 per cent above that in the corresponding period last year.

Production of lumber during the week ended July 10 stood at 69 per cent of the 1929 weekly average. Production was 25 per cent above new business booked and 19 per cent larger than reported shipments. The level of output was the lowest since the week ended March 20. The volume of orders received was the lowest for any week this year.

Average daily crude oil production for the week ended July 17 amounted to 3,557,950 barrels, as compared with 3,520,750 barrels for the week before and 2,978,350 barrels a year ago.

Fisher Index Eases

Professor Fisher's index of wholesale commodity prices for the week ended July 24 stood at 92.3, as compared with 92.5 the week before and 92.9 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended July 21 showed declines of $3,000,000 in holdings of discounted bills and of $1,000,000 in holdings of bills bought in the open market. Government securities remained unchanged. Money in circulation declined $21,000,000, and the monetary gold stock declined $19,000,000.

Car Makers List Suppliers

The American Bantam Car Company, Butler, Pa., announced the list of material manufacturers with whom commitments have been made and orders placed for dies and raw materials for the new American Bantam auto. They are: Hayes Body Corporation, Grand Rapids, Mich., steel body stampings; Transue-Williams Steel Forging Co., Alliance, Od, forgings; Spicer Manufacturing Co., Toledo, O., axles; Motor Wheel Corporation, Lansing, Mich., wheels; Detroit Body Die Co., Detroit, Mich., fender dies; Rockford Drilling Machine Co., Rockford, Ill.. clutches; Firestone Tire and Rubber Co., Akron, O., tires; Morrison Steel Products, Inc., Buffalo, N. Y., steel stampings; Marquette Metal Products, Cleveland, O., screw machine products; Murray-Ohio Manufacturing Co., Cleveland, O., steel stampings; National Bronze and Aluminum Co.. Cleveland, O., aluminum castings; Western Automatic Machine Screw Co., Elyria, O., screw machine products; Electric Auto-Lite Co., Toledo, O., electrical equipment; Jackson Motor Shaft Co., Jackson, Mich., machine work.

Hupp Motor Car Corp. announced the following list of manufacturers from whom parts and materials will be obtained for 1938 models: Spicer Manufacturing Corporation, Toledo, axles and propeller shafts: Carter Carburetor Corporation, St. Louis, carburetors; Spring Perch Company, Lackawanna, N. Y., springs; Warner Gear Company, Muncie, Ind.. transmissions and over-drives; Budd Wheel Company, Detroit, wheels; Gemmer Manufacturing Company, Detroit, steering gears; Midland Steel Products Company, Cleveland, frames; C. M. Hall Lamp Company, Detroit, lamps; General Spring Bumper Corporation, Detroit, bumpers; Perfection Industries, Inc., Detroit, instrument panels; Sheller Manufacturing Corporation, Portland, Ind., steering wheels; American Forging & Socket Company, Pontiac, tubular seat frames; and D. L. Auld Company, Columbus, hub caps.

Car Stocks Dwindle

(Continued from page 135)

Chevrolet dealers delivered 421,712 used cars in May and June, and reduced stocks to a national level of 89,615 units by the end of June.

Paul G. Hoffman, president of The Studebaker Corporation reported the sale of 3161 passenger cars and trucks in the first 20 days of July compared with 926 in the corresponding period of July, 1936, an increase of 242 per cent. For the year to date sales are 59,803 compared with 48,510 last year, an increase of 23 per cent.

Cadillac-LaSalle set a new record for June business when it reported delivery of 4404 cars to customers. This topped the best previous June by 25 per cent and topped last June by 118 per cent. Model deliveries have totaled 33,215 units against 18,283 of the 1936 series.

Pontiac for the first half of the year built 131,254 cars against 97,978 last year, a new record. Domestic sales for the period were 121,437 cars against 95,502 last year. In June alone production was 27,935 cars against 18,747 last year. On June 17 a new production mark of 1521 cars was set. The division had 11,450 employees at the end of the month, also a record.

GM Earnings Decline

(Continued from page 135)

tolerate such a complete disregard of its own rights." He remarked that industry has the obligation of giving all its workers as much work as possible and also has an obligation to the communities in which it operates.

Union leadership must develop a "proper respect" for its agreements, written or otherwise, he said, forecasting that responsibility may one day be superimposed from without by due process of law. The community at large will realize that the losses sustained by General Motors have been unnecessary and unreasonable, stated Mr. Sloan.

On the matter of the costs of doing business, Mr. Sloan said the company might have had the chance to offset them through volume production if it had been able to do so. "Costs," he added, "also reflect a certain decrease in labor efficiency." The full effect of higher materials costs is not yet reflected because it covers requirements many months in advance.

"Naturally," stated Mr. Sloan, "this trend toward rapidly increasing costs must, of necessity, reflect itself in the form of a substantial increase in selling prices, with due regard for the effect of volume. Just how much this must be, is impossible to state at this time because the facts are not yet available."

Plans Large Glass Output

Libbey-Owens-Ford Glass Co. has worked out plans with principal customers to enable it to maintain operations at present high level for the remainder of the year, according to John D. Biggers, president.

It is understood that the company already has specifications for 1938 cars from some of the General Motors cars for safety glass requirements.

Company net earnings for first half of 1937 were $5,631,468 or $2.25 a share contrasted with $2.04 a share in like period last year. Directors declared a dividend of $1.50 a share payable Sept. 15 to holders of record Aug. 31.

. . . *slants*

NEW CARS BY DECREE—*All Moscow car owners will have new automobiles in the near future by order of the Council of People's Commissars. The council, it seems, is determined to remove from the streets all old Russian and foreign cars, and is requiring their owners to turn them in for new C-1 sedans from the Molotov plant. A trade-in commission has been appointed to appraise old cars and a municipal credit organization will finance the deals on a two-year basis.*

MUSICAL MOMENTS—*Latest idea for trailers is the installation of an organ. The advertising suggests that the way to keep jolly, carefree and happy is to add one to the equipment. Song books are also available.*

QUITE A RELIEF—*Assembly line workmen at the big automobile plants get awfully tired of seeing green bodies come along at just the right moment to meet chassis with green wheels as they should. In fact, so the story goes, they got so tired of the efficiency at one*

plant recently that when by a frightful error a yellow body came along to meet some green wheels, everybody stopped work and cheered.

A RECORD — *More than* 5,000,000 *pieces of direct mail have been used to spur sales of the* 1937 *Pontiac, an all-time record for this type of advertising, according to the company. The mail drive, which began last fall, included two types of mailings: general and specific. The general mailing, conducted by the factory, consisted of an eight-page rotogravure paper and later a* 16*-page color catalog. The specific direct mail included the personalized pieces, containing an individual salesman's card.*

Harvard Traffic School to Open

To help fill a growing demand for trained engineers in American cities to handle traffic problems, the first school of its kind ever conducted, a Traffic Engineering Training School, will open next month at Harvard University, under sponsorship of the Harvard Bureau for Street Traffic Research and the Institute of Traffic Engineers. Announcement of this new venture to enable young engineers to fit themselves for a career growing in importance was made by Burton W. Marsh, director of safety and traffic engineering of the American Automobile Association, who will be dean of the new school. Maxwell Halsey, assistant director of the Harvard Traffic Bureau, will be director of the school, and Theodore Matson, research associate of the bureau, will be assistant director.

In announcing the opening of the school, which will be held Aug. 16-18, Mr. Marsh said:

"The two-weeks' intensive training course covers engineering techniques which can be applied to traffic problems. This course is designed primarily for municipal, county, state and Federal engineers and will provide them with specific engineering attacks to the problem which can be immediately used within their own jurisdictions."

The American Public Works Association, Automotive Safety Foundation, American Automobile Association, National Safety Council, National Conservation Bureau are cooperating in conducting the school.

New Ford Motorship Sails

The Ford motorship *Green Island,* first vessel to be completed in a Great Lakes shipyards in more than six years, cleared July 2 on its maiden voyage, bound for the Ford plant at Green Island, N. Y., after which it was named. The motorship, in command of Capt. O. Meling, is laden with a cargo of Ford parts for the Green Island plant, and additional parts destined for the Ford tidewater branch assembly plants at Edgewater, N. J., and Chester, Pa. It is the first all-welded steel hull ever to be built. Its sister-ship, the Norfolk, named at the city of Norfolk, Va., and the Ford tidewater assembly plant there, is expected to be ready for service within a few weeks. The Green Island is the twenty-ninth vessel in the Ford fleet, which comprises two other motorships, two 600-foot Great Lake freighters, ocean vessels, tugs and barges.

Automotive Metal Markets

Higher 1938 Car Prices Would Bulwark Steel Market, Is View; Large Automobile Company Orders Due

The prices at which 1938 model cars will be offered to the public will be a major factor in shaping the steel market's course.

Reaffirmation of prevailing steel prices for fourth quarter shipment makes it doubly certain that 1938 car prices will be nowhere more eagerly analyzed than in the steel industry. If they show that the rise in finished steel prices of from $5 to $7 a ton in the second quarter, which followed a previous advance of $4 per ton over the year's initial prices, has been adequately passed on to the ultimate car buyer, this will be interpreted as definite acceptance of the higher steel prices by the automobile manufacturers.

By the same token, if 1938 car prices should reveal that the makers of the popular-priced automobiles have determined to continue their policy of absorbing higher steel costs, so as not to jeopardize their mass market, an element of uncertainty regarding the 1938 price outlook will unquestionably be introduced into the steel market.

Meanwhile steel producers expect considerable automotive business to be placed within the next few weeks. With no change in prices scheduled, third and fourth quarter business will more or less overlap each other. Fifty thousand tons of sheets, ordered by the Ford Motor Company, are scheduled for early shipment and finishing mills look for duplication of this order following resumption of activities in the Ford plants next month. Strip steel orders, not requiring as much time to fill as is the case with sheets, are temporarily running relatively light, with a turn for the better looked for as soon as covering against heavier assemblies gets under way. With the Ford steel plants in full operation while assembly divisions are shut down, resumption of operations by the latter in the second week of August will find them with a considerable reserve of steel for conversion into parts.

Alloy steel specialists are preparing for a generally expected increase in the demand this fall, especially for the nickel-chromium types of automotive steels.

Pig Iron—In some of the Middle West markets shipments this month are running higher than in June, an unusual occurrence. On the whole, however, tonnage buying by automotive foundries is still in abeyance. Prices remain unchanged.

Copper—Demand is only fairly good, but talk of an advance is kept alive because the export price again is fractionally higher than the domestic level which continues at 14 cents, with the c.i.f. Liverpool price around 14¼ cents. The month's bookings early this week were reported at around 37,000 tons.

Tin—The market continues to seesaw. Whenever it approaches the 60-cent level, decided resistance on the part of American buyers makes itself felt. Several round lots of lower-priced Chinese tin changed hands this week. London cables report that a subcommittee of the International Tin Committee is at work to devise a scheme whereby too sharp and too frequent fluctuations can be avoided. Spot Straits tin sold at 59⅛ cents at the beginning of the week and this price level continued in effect on Tuesday.

Zinc—Some foreign zinc is reported to have been bought for American account. Whether this is intended for use in filling export orders remains to be seen. W. C. H.

Safety Plan Offered

Health Guild Backs Program for Training Drivers

A plan for the training of those learning to drive automobiles, for the testing of applicants for licenses, and for the disciplining of careless or wilful drivers, developed in an effort to reduce street and road accidents is presented in the July issue of *Health Digest,* publication of the Health Guild of America.

Developed by W. Hamilton Owens of New York City and selected for approval and sponsorship by the Committee on Safety of the Health Guild of America, the plan calls for the construction near the city it would serve of a safety area which would include streets containing every known traffic hazard.

The area would be about 1000 ft. square. Within it would be one-way streets, dead-end streets, traffic circles, railroad crossings and the like, with traffic control systems and patrolling police. Administration buildings for instruction and license examinations would be provided. Schooling of intending drivers and correction of the unskilful would be carried out in the area with progress records kept.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

From Paris to St. Petersburg

A herculean race is on the tapis for next year—no less a tour de force than a run from Paris to St. Petersburg, a distance of nearly 2000 miles. The route proposed is through Mauberge, Namur, Liege, Aix-la-Chapelle, Cologne, Hanover, Magdeburg, Berlin, Sonnenburg, Posen, Warsaw, and thence up to St. Petersburg.

The detail connected with the preparation of such a race would be enormous. The consent of all the officials of the different countries and towns traversed would have to be obtained, and arrangements made for the safety of both racers and residents. Depots for supplies and refreshments would have to be provided at frequent intervals, as well as storage places for the vehicles at night. Owing to the bewildering variety of the road laws of the villages on the route, considerable delay and difficulty would be met in simply securing permits to pass through their confines . . . as a demonstration to the other European nations, of the universal powers of the motor carriage, the contest ought to be a success.

"Hear ye not the hum of mighty workings? Listen awhile ye nations, and be dumb."

—From *The Horseless Age,* August, 1897.

Reserve Board Index Dips

Production index of the Federal Reserve Board covering automobiles shows that on an adjusted-for-seasonal-variation basis the level for June was 130 against 135 in May and against 118 in June, 1936. Unadjusted, the index stood at 147 in June against 163 in May and 134 a year before. Comparisons were made with 1923-1925 as 100.

The factory employment index, adjusted, was 134.1 in June against 133.3 in May and 112.4 in June a year ago. Unadjusted, it was 138.1 against 140.0 in May and 115.8 a year earlier. Unadjusted payroll index was 132.3 in June against 143.8 in May and 107.1 in June, 1936.

Graham Sales Increased

A dollar volume increase of $1,042,174 in Graham factory sales for the nine month period ended June 30 compared with the similar period in 1936, is reported by F. R. Valpey, vice-president and general sales manager of the Graham-Paige Motors Corporation. "Our total factory sales for the nine month period just ended totaled $12,703,733 and we shipped 17,031 cars to dealers during this period," says Mr. Valpey. "This is an increase of approximately $1,042,174 over our business for the comparable period ending June 30, 1936, when the total was $11,661,559 and we shipped 17,156 cars."

Index on Press

The index to Vol. 76, January to June, 1937, of AUTOMOTIVE INDUSTRIES is now being printed and will be available to subscribers in a few days. We will gladly send a copy to any subscriber on request.

AUTOMOTIVE INDUSTRIES

Looks Ahead

FIRST issue of Automotive Industries each month, for the past 14 months has contained as leading feature a manufacturing story on one of the great plants in the industry. The other day we got to counting up some figures on the series of articles and found that during the life-to-date of the series, including what has been printed of it in the magazine and what has been reprinted for distribution elsewhere, the total of pages printed in the series reaches the staggering (to us) figure of 5½ million plus.

WHICH is by way of introducing the fact that plans are under way to continue the series through next year, with more plants represented, and a record of what production-facility changes have occurred in plants described earlier in the series. As always, we welcome suggestions from readers about the series or any aspect of it.

Domestic Tool Orders Dip

A decline in domestic machine tool orders in June brought the three month index of the National Machine Tool Builders' Association down slightly; foreign orders increased. The association says the May and June reaction has been strong enough to correct the three months average trend. The three months curve is used because of the erratic action of a single month index.

MEWA Co-operates With FTC

Directors of the Motor Equipment Wholesalers Association at a recent meeting in Chicago adopted a resolution recording its desire to cooperate with the Federal Trade Commission in that body's drive to "correct conditions in the distribution of automotive products." The association went on record as favoring perpetuation of a "free and open market in such distribution." The association will do legal research work to aid the Government in determining whether certain reported practices are infractions of the Robinson-Patman Act.

Charles B. Wilson

Charles B. Wilson, chairman of the board and one of the founders of the Wilson Foundry & Machine Co. of Pontiac, Mich., and chairman and treasurer of the Baldwin Rubber Co., died June 23 at his home at Bloomfield Hills, Mich. He was born at Warren, Ohio, in 1872. He began his career in the automotive field as works manager for the Olds Motor Works in 1898.

Mr. Wilson was the brother of David R. Wilson, president of Willys-Overland Motors, Inc. The Wilson Foundry & Machine Co. makes engines for Willys-Overland cars.

C. B. Wilson was active in rehabilitating the old Willys-Overland company in 1921. During the World War he had a great deal to do with manufacture of parts for Curtiss and Liberty Engines and for British tanks. His foundry also made quantities of shells.

During the depression he was instrumental in the organization and operation of the Oakland County Poor Commission. Later he served as conservator of the First National Bank which was forced to close during the period of banking troubles.

Calendar of Coming Events

SHOWS

Second Winter Item Show, Automobile Accessories Association, Chicago, Aug. 9
Poland, Automobile Salon (Foire Orientale), Lwow .....Sept. 1-15
Yugoslavia, Automobile Section, Autumn Fair, Ljubljana .....Sept. 1-12
Yugoslavia, Automobile Section, Commercial Fair, Belgrade.....Sept. 11-21
France, 31st International Automobile Salon, Paris .....Oct. 7-17
Great Britain, 31st International Automobile Exposition, London....Oct. 14-23
Czechoslovakian Automobile Show, Prague .....Oct. 16-24
National Automobile Show, New York, Oct. 27-Nov. 3
Toledo, O., Automobile Show..Oct. 27-Nov. 3
Italy, 10th International Automobile Salon, Milan .....Oct. 28-Nov. 8
Boston, Mass., Automobile Show, Oct. 30-Nov. 6
Los Angeles, Cal., Automobile Show, Oct. 30-Nov. 7
San Francisco, Automobile Show, Oct. 30-Nov. 7
Cincinnati Automobile Show.Oct. 31-Nov. 6
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London...Nov. 4-13
Chicago Automobile Show.....Nov. 6-13
Akron Automobile Show.....Nov. 6-12
Omaha Automobile Show.....Nov. 6-11
Brooklyn Automobile Show.....Nov. 6-13
Columbus Automobile Show .....Nov. 6-12
Detroit Automobile Show.....Nov. 6-13
Motor Truck Show, 4th Annual, Newark, N. J. .....Nov. 6-12
Newark, N. J., Truck Show.....Nov. 6-12
Buffalo, N. Y., Automobile Show..Nov. 6-13
Indianapolis, Automobile Show....Nov. 6-13

Show Business

Manager of the National Automobile Show in New York is Alfred Reeves, 366 Madison Ave., N. Y. C. Inquiries concerning all matters connected with the national show should be addressed to him. AUTOMOTIVE INDUSTRIES will be pleased to furnish names and addresses of local show managers on request.

Newark, N. J., Automobile Show..Nov. 6-13
Philadelphia Automobile Show....Nov. 6-13
Pittsburgh, Pa., Automobile Show.Nov. 6-13
Toronto, Ont., Automobile Show..Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, Glasgow .....Nov. 12-20
Baltimore, Md., Automobile Show, Nov. 13-20
Cleveland, Ohio, Automobile Show, Nov. 13-20
Jersey City, N. J., Automobile Show, Nov. 15-20
Milwaukee, Wis., Automobile Show, Nov. 17-24
Springfield, Mass., Automobile Show, Nov. 14-20
St. Louis, Mo., Automobile Show.Nov. 14-21
Portland, Ore., Automobile Show.Nov. 14-21
Denver, Colo., Automobile Show, Nov. 15-20
Montreal, Que., Automobile Show, Nov. 20-27
Kansas City, Mo., Automobile Show, Nov. 27-Dec. 4
A.S.I. Show, Navy Pier, Chicago, Dec. 6—Dec. 11

CONTESTS

National and International Soap Box Derby Finals, Akron, Ohio.....Aug. 15
Pan American Cup Race, Roosevelt Raceway .....Sept. 6
National Outboard Championship Regattas, Richmond, Va.....Sept. 18-19

CONVENTIONS AND MEETINGS

Automobile Trade Association managers, meeting, Chicago.....Aug. 4-6
U.A.W. Annual Convention, Milwaukee, Aug. 23
International Congress on Carbohydrate Carburants, Rome .....Sept. 10-12
S.A.E. Section Regional Tractor Meeting, Akron, Ohio.....Sept. 15-17
American Transit Association, 56th Annual Convention, White Sulphur Springs, W. Va.....Sept. 19-23
S.A.E. Section Regional Transportation Meeting, Chicago .....Sept. 29-Oct. 1
American Foundrymen's Association Midyear Meeting, Columbus, Ohio, Sept. 30-Oct. 1
S.A.E. Fuels and Lubricants Regional Meeting, Tulsa, Okla. ...Sept. 30-Oct. 1
S.A.E. National Aircraft Production Meeting, Los Angeles, Calif.....Oct. 7-9
American Foundrymen's Association, Regional Conference, Rolla, Mo., Oct. 8-9
National Metal Congress, Atlantic City, Oct. 18-22
S.A.E. Annual Dinner, Commodore Hotel, New York.....Oct. 28
American Petroleum Institute, 18th Annual Meeting, Stevens Hotel, Chicago .....Nov. 8-12
S.A.E. National Production Meeting, Flint, Mich. .....Dec. 8-10

Just Among Ourselves

An Opportunity for Good Publicity

A GOOD many automobile manufacturers have used motion pictures in sales work for a long time. In one or two outstanding cases, factory-sponsored films have obtained general booking in motion-picture theatres. An opportunity for further extension of the idea has been pointed out by the National Educational Film Foundation, which cooperated with educators and institutions interested in using films in schools and other institutions.

The new slant is that a good many commercial films would be acceptable educational material if the commercial elements were toned down or pruned. The National Educational Film Foundation is seeking such pictures and would be glad to discuss a distribution plan with interested manufacturers. The Foundation itself is organized on non-profit lines and has apparently as its sole function the assisting of schools to obtain modern teaching films.

* * *

All Quiet on the Labor Front

WE have several reasons for believing that there will be no serious labor disturbances in the industry before the middle of September. First of all, the United Automobile Workers International Union has several fences it must build before undertaking another general movement. The two chief factions of the Union have in separate caucuses confirmed their intention to reelect Homer Martin as the Union's president at the forthcoming (Aug. 23) convention of the Union in Milwaukee. But real solidarity in the Union must await majority confirmation of this position at the convention.

There must also be settled on the floor the question of the Union's attitude as a whole to unauthorized strikes and the Union's remedy for them. Union officials, publicly, have taken a stand against unauthorized strikes, but so far disciplinary action within the Union has been of the "slap on the wrist" variety. Local organizers have been "transferred" to other territories.

As things stand, a frown from John L. Lewis is the most potent discipline the Union recognizes. We know of one case in which a CIO organizer failed to obtain his objectives. His own final summary of the matter was "John Lewis will give me hell for this when he hears about it."

In recent utterances of W. S. Knudsen and Alfred P. Sloan, General Motors has taken a strong position on its future dealing with the Union. Very little progress is being made on unionization of Ford plants. The Federal Courts have outlawed the sitdown strike. The Administration at Washington is faced with saving its face on a number of things and labor may not look like the best one to begin fiddling with.

These are some of the things which make us believe that a major labor crisis will be postponed for some time.

* * *

Chrysler Gives Credit Where Credit is Due

WALTER P. CHRYSLER'S autobiography, written with the assistance of Boyden Sparkes, continues to furnish illuminating sidelights on the growth and structure of the automobile industry to current readers of the *Saturday Evening Post*. In the last installment we were particularly caught by Mr. Chrysler's references to the contributions of the machine tool builders to the progress of the industry.

When Mr. Chrysler became production manager at Buick, the bottle-neck of the production process was final assembly. Successive improvements reduced final assembly time to the point where the flow of parts and sub-assemblies became the vital problem. From then on, as Mr. Chrysler points out, the tool builders were handed assignments which began with a definition of the job to be performed.

Sometimes the problem was solved in a few weeks with design and production of a new lathe head, or a different arrangement of existing equipment. Sometimes the problem was of such a nature that it took years to reach a solution—but, Mr. Chrysler emphasizes, the tool builders always came through. We have never seen a better statement than Mr. Chrysler's on how much such cooperation has meant to the automobile industry.—H. H.

100% Pennsylvania Oil and What It Means . . .

By Joseph Geschelin

FROM the standpoint of "consumer protection," the work of the Pennsylvania Grade Crude Oil Association holds the same unique significance in the field of automotive lubricant as does the work of Ethyl Gasoline Corp., in the field of power fuels.

The motoring public as well as the engineering fraternity are rather well acquainted with the emblem of the Association which identifies licensed producers and marketers of 100 per cent Pennsylvania oils. Nevertheless, it is quite probable that very few people, even among those directly concerned with the automotive field, know precisely the objectives and modus operandi of the Association, and it is our object here to present a high-spot picture of this novel set-up.

We may note at the outset that the Association's work bears the weight of unprejudiced authority, in its sphere of influence, by virtue of being a cooperative project in which responsibility is shared jointly by the State of Pennsylvania and an important State industry. All of the technical work is done at The Pennsylvania College under the supervision of its faculty and all publications and reports are issued by authority of the College.

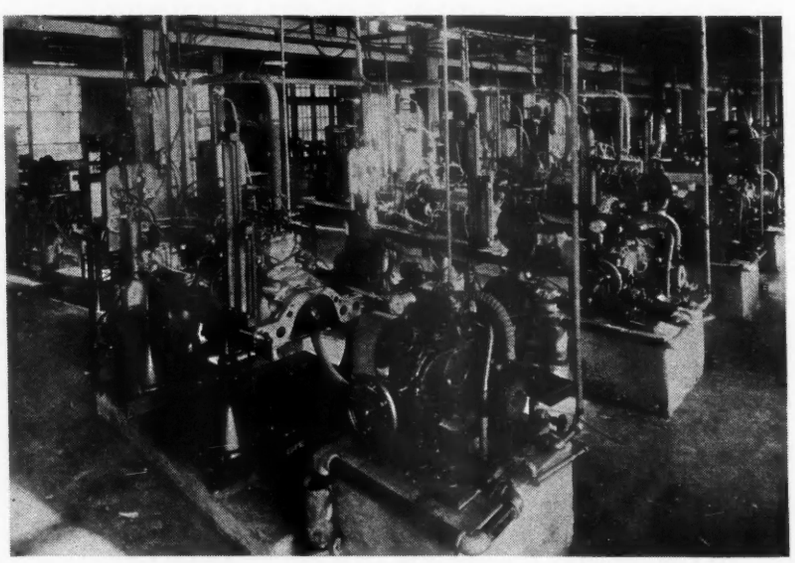
An interesting feature of the set-up is the fact that all laboratory equipment, whatever its nature, used for Association projects is supplied out of Association funds but is installed in laboratory space provided by the College. Similarly, although all details are controlled by the College staff, the actual studies are made by full-time research workers who are paid by the Association, but who are employes of the College. The latter are assisted by students and research fellows in many details of the test work carried on.

Weight of authority for the research program and its publication comes from a division of responsibility between the College staff and a technical committee of the Association. When it comes to publication of results, the situation is controlled by the exercise of veto power equally divided between the two groups.

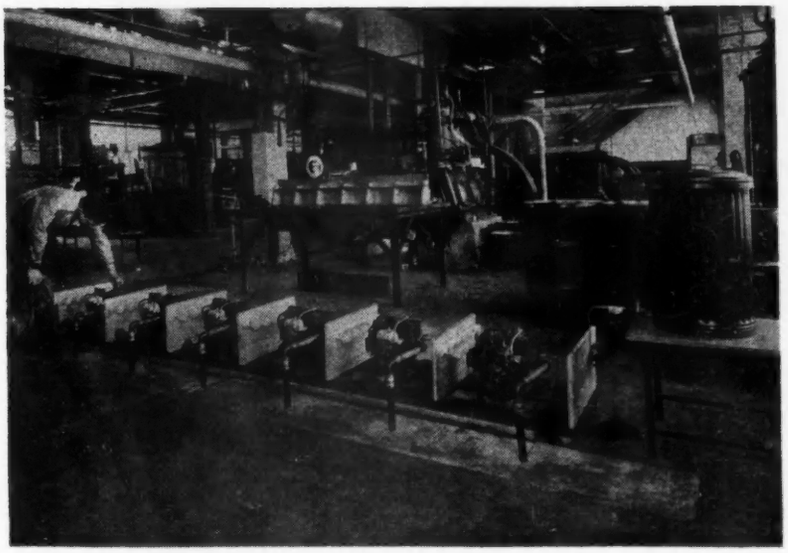
What are the aims and purposes of the Association? This can be answered directly by noting first that the work may be divided roughly into two major activities — chemical and mechanical. The extensive testing of oils carried on by the Petroleum Refining Laboratory is concerned mostly with the identification of oils and the maintenance of the standards set up by the Association for oils marketed under its emblem. It includes the inspection of samples of emblem brands samples of other Pennsylvania oils, and evidence of fraud. In addition, there are research projects of fundamental value which develop out of the more or less routine procedure. That's the chemical side of the picture.

Mechanical testing carried on by the department of mechanical engineering may be likened to the familiar adage that "the proof of the pudding is in the eating" for it is the conclusion of the practical scientific man that after all the best evidence of "consumer satisfaction" is in the performance of the product under actual operating conditions. Consequently, the mechanical testing seeks to discover "What does an engine do to the oil and, conversely, what does an oil do to the engine?"

We may set down in principle that this program is essentially one of consumer protection and consumer satisfaction. Naturally, it encompasses the problems of satisfying first the requirements of industry—the automotive industry in this instance—by fitting the oils to constantly changing conditions. There is, in addition, a program of trouble-shooting which carries the investigation out into the field—to the public through service stations and dealer contacts—to the fleet operators



1. Rear view of battery of six passenger car engines used for determination of service performance of lubricating oils.

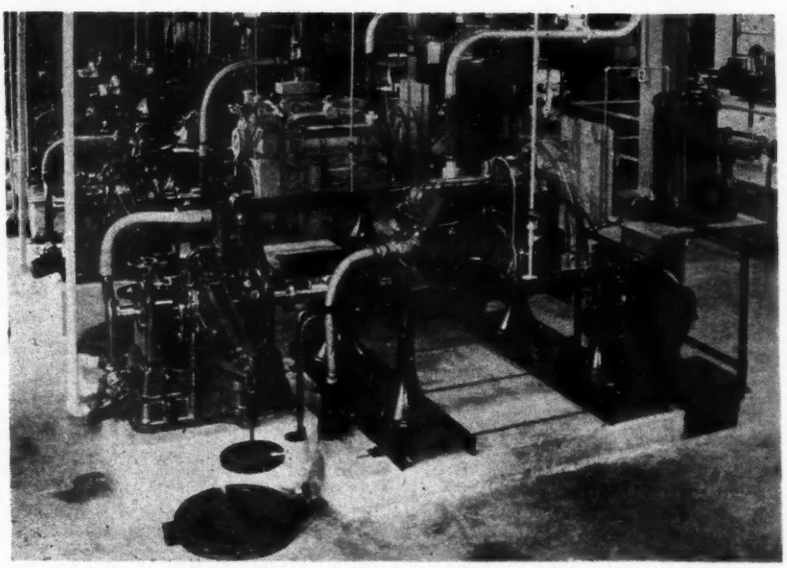


3. This battery of six identical small gasoline engines, operated simultaneously, is used for studies of carbon formation.

—to the manufacturers of machinery and engines.

To make its contact with the automotive industry more intimate, the Association recently established a resident engineer—H. M. Rugg—in the Detroit area.

More recently, the Association has taken steps to expand its activity by embarking on studies of Diesel engine lubricants and fuels. This is recognized as being of wide economic importance in the transportation field and



2. In the same bank, adjacent to the six engines shown in Fig. 1, are two new Diesels. The one in the foreground is a six-cylinder Hercules rated 80 hp. at 2600 rpm.; the other is a four-cylinder Caterpillar rated 40 hp. at 1400 rpm.

should develop into a major program in its own right.

Before we move along to the discussion of the work of the Association, let us make clear that it is dependent of and not to be confused with the general research of the college. The latter has made its mark in contributions in the field of the automotive high-speed Diesel with classic studies of the combustion process, fuel injection phenomena, and Diesel fuel ratings, together with a variety of chemical and chemical engineering studies on petroleum refining, constitution of gasoline, improved fuels and lubricants.

It is a matter of common knowledge that Pennsylvania oils have a reputation for high quality standards and demand a premium price. To show precisely the nature of the basic standards set up by the Association, we have reproduced in Table 1, the minimum emblem specifications as defined in the License Regulations of the Association, dated November 19, 1936.

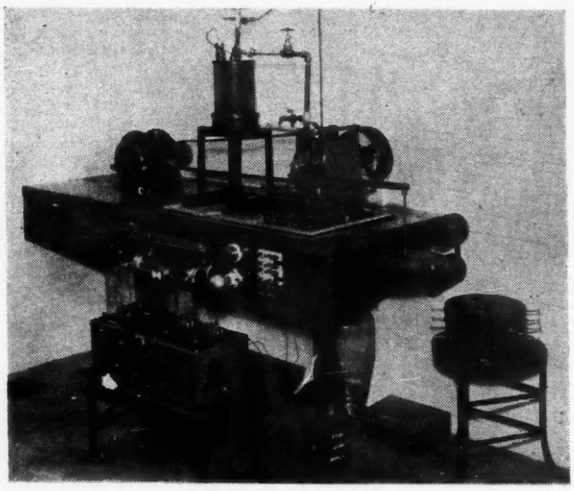
In Table 2, we give you the staff of specialists concerned with Association projects, comprising—Petroleum Refining Laboratory, Mechanical Engineering Laboratory, and the Association technical committee.

We mentioned earlier that the work described here may be divided roughly into two types of activities—mechanical and chemical. It is our object to describe both in more or less detail at least as to high-spots, taking the mechanical laboratory first since it is of more direct interest to the automotive engineers and technologists.

Mechanical Laboratory and Testing

In principle the work of this department holds to the central theme that the ultimate test of quality and consumer satisfacion resides in the performance of the product under actual service conditions. Consequently, chief reliance is placed upon formal test procedure with production automobile engines purchased directly from the car builders. Due to practical considerations surrounding Association work and also because of the variability of test conditions on the road, all of the testing is done on the test stand where the gamut of variables entering into performance may be subject to complete control and reproducible results.

Engine tests are parallelled by other unique studies. Consider for example the matter of carbonization. True, the chemist has a variety of chemical tests to determine the character and amount of carbon present in any oil sample. Yet there is an elusive quality in oils which makes it quite difficult to determine from chemical tests alone what the effect will be in an actual engine. Accordingly the laboratory has just recently installed a battery of small



4. Bradford machine used in study of frictional characteristics of oil in partial bearings at pressures up to 30,000 lb. per sq. in. and at rubbing speeds up to 500 ft. per min.

single-cylinder engines which will be used exclusively for the exploration of carbon-forming characteristics. With these small engines of special design, it is feasible to weigh the entire combustion chamber element on accurate chemical balances and thus determine the actual weight of carbon desposition.

A collateral investigation is an oiliness of lubricants. The devices used are a modified Timken machine, a Kingsbury drill press machine and a Fayville-Levalley machine. The last mentioned is a new type for the rapid testing of extreme pressure lubricants and it suitable also for the determination of coefficient of friction at rather high pressures.

The original investigation of engine lubricants was authorized in 1933, using seven different oils for a mileage equivalent to 20,000 to 30,000 mi. The work was done on a battery of four six-cylinder Dodge engines which were operated at r.p.m. equivalent to a road speed of around 60 m.p.h., simulating road conditions on the test stand.

A complete description of the original investigation with details of the procedure, equipment, and instrumentation will be found in Bulletin 44, Engineering Experiment Station Series, of The Pennsylvania State College. Its authors are—H. A. Everett, head, department of mechanical engineering, and F. C. Stewart, associate professor of mechanical engineering.

Subsequently a battery of new engines was installed for continuing the project with engines of current production. At the present time, as shown in the illustrations, there are two Dodge six-cylinder engines used for general testing of lubricants; two Pontiac eight-cylinder engines, used at first for bearing corrosion tests; and two new Diesel engines. The latter consist of a Caterpillar four-cylinder engine developing 44 h.p. at 100 r.p.m. and a Hercules six-cylinder Diesel, developing 78 h.p. at 2600 r.p.m. Two of the latest Froude dynamometers were purchased and are set up on the test stands for these engines.

When the first step in the laboratory's work on Diesel testing, that of comparing the effect of widely different fuels, is completed, the main problem of investigating the results of the use of different oils will be attacked. Service performance of various oils used in the Diesels will then be compared with results obtained from using the same or similar oils in the automotive engine battery in the same laboratory. Work on the latter group has been carried on for several years. From the combined data the laboratory expects to obtain definite information on the performance of Pennsylvania oils. In addition, the studies being currently made in the chemical laboratory will be correlated with the engine data.

Many unique features characterize the test stand equipment for oil tests. Lubricating oil flow is controlled and measured by meters; gasoline is measured by a Venturi meter and air by an orifice to give the air-fuel ratio desired. A stroboscope has been constructed for setting and maintaining the engine speeds accurately. Micrometer controls on the throttles permit particularly fine adjustment.

Proceeding on the general basis that the most desirable oil for automobile engine lubrication is the one which is used up least rapidly and affords greatest protection to the motor, consump-

Table 1—Minimum Emblem Specifications

SECTION 3-A

(a) All tests and determinations recorded in the Association regulations shall be construed as the tests and determinations made by the Petroleum Refining Laboratory at State College, Pa.

SECTION 3-B

(a) Only motor oils manufactured from 100% Pure Pennsylvania Grade crude oil and meeting or exceeding established minimum specifications shall be sold in or from or be placed in any container on which the Association emblem is displayed.

(b) The term "100% Pure Pennsylvania oil" as used herein shall be construed in all cases to mean the product of crude oil produced from within the geographic area commonly recognized as the Pennsylvania oil region and which, by standardized tests, can be identified as the product of crude oil of Pennsylvania grade as commonly understood in the trade.

SECTION 3-C

(a) The use or presence of unfiltered steam refined cylinder stock is prohibited in any and all automotive internal combustion motor lubricants to be sold under the Association emblem.

SECTION 3-D

(a) All neutral oils to be blended with bright stock and sold in or from or placed in containers bearing the Association emblem must be manufactured from 100% Pure Pennsylvania oil and equal to or better than the following minimum specifications:

Gravity—29½ or lighter for 25 pour with proper allowance for lower pour test oils.
Flash (Cleveland open cup) —420 minimum
Viscosity @ 100°—180 minimum.
Viscosity Index (Saybolt Machines)—100.
Color (N.P.A.)—No. 3 maximum.

(b) In the case of all long residuum oils to be sold under the Association emblem, the constituent parts thereof must equal a blend of a Pennsylvania neutral oil of 180 seconds @ 100° and a No. 8 Pennsylvania bright stock of 540 flash or higher.

(c) The blending of 200 @ 100 neutral with 150 @ 100 neutral, or any other blends of any other neutrals or D or E stock or other residual oils in the making of 180 @ 100 neutrals to be sold as motor oils under the Association embem is expressly prohibited.

SECTION 3-E

(a) The Association emblem may be displayed on packages containing special oils, not sold as internal combustion motor lubricants, compounded with animal fats, chemical compounds or vegetable oil, provided the mineral content thereof is manufactured entirely from Pure Pennsylvania Grade crude oil.

(b) The use of the Association emblem is specifically prohibited on all internal combustion motor lubricants containing any material of vegetable or animal origin, or a mineral oil which is not a product of Pennsylvania Grade crude oil.

Table 2—Coordinating Staff for Pennsylvania Grade Crude Oil Association Program

Dean Frank C. Whitmore, School of Chemistry and Physics, general charge of program.

Petroleum Refining Laboratory

Dr. M. R. Fenske, head
Dr. F. L. Carnahan, associate

Dr. M. R. Cannon, Dr. K. A. Varteressian, C. E. Fink, Rodney Hersh, J. A. Pollock, A. R. Rescorla, research assistants.

Mechanical Engineering Laboratory

Prof. H. A. Everett, head dept. of mechanical engineering.

L. J. Bradford, professor of machine design.

G. H. Keller, research assistant in charge of experimental work.

W. F. Taylor, research assistant.

W. S. Wilson, research assistant.

Technical Committee of the Association

A. D. David, G. H. B. Davis, R. E. Dunham, E. E. Ebner, B. L. Heath, MacLean Houston, W. A. Johnston, G. M. Kirkwood, J. T. McCoy, T. G. Murphy, C. A. Peterson, F. J. Philippbar, P. M. Robinson and C. R. Wagner.

tion is very carefully measured, and many delicate quantitative tests for iron in the lubricating oil are made during the course of a run. Viscosity change, sludge formation and change in Conradson carbon residue are followed through samples withdrawn from circulation and sent to the Petroleum Refining Laboratory for analysis. The deposition of carbon during the course of a run is followed; the residue on the completion of the 24-hour period of operation for a given oil is scraped off and weighed.

Through a knowledge of the effects produced by other variables, it has been found that conditions of operation such that even slight detonation occurs suffice to establish a considerable increase in the rate of consumption of lubricating oil.

Petroleum Refining Laboratory

The work of this laboratory is concerned chiefly with the identification of oils and maintenance of the standards set up by the Association for oils sold under its emblem. However, the end product of the more routine duties has been the development of valuable fundamental research both on lubricants and fuels.

For example, it was necessary at the very outset to identify the Pennsylvania oils precisely and then set up testing procedures by means of which such oils could be identified even in obscure or border line samples where Pennsylvania oils have been compounded with other materials.

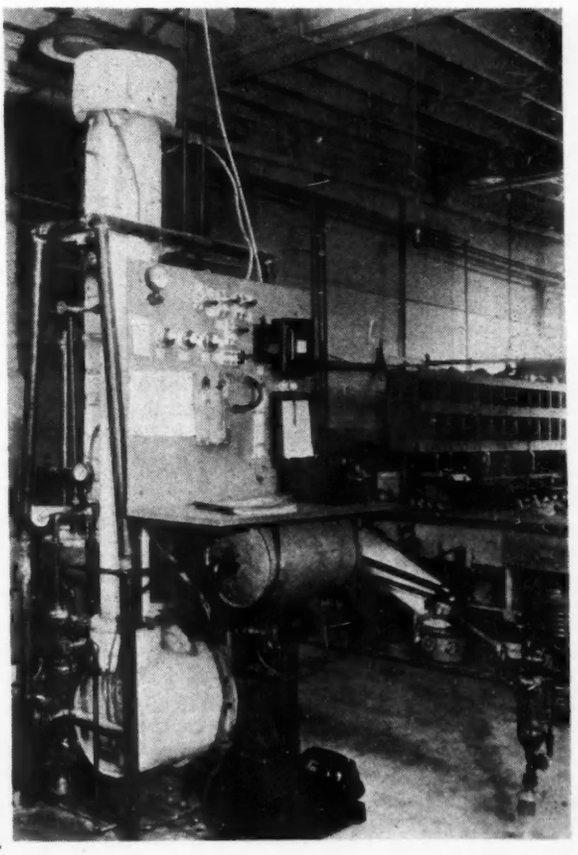
One of the most common tests in the investigation of lubricating oils is the determination of their viscosity, yet almost all of the instruments devised for this purpose give readings which are not related to true viscosity in any simple way. This laboratory has developed for both routine and research purposes, pipettes, based on the Ostwald but very considerably modified, which allow fairly rapid viscosity determinations of great accuracy. Temperature control is assured by immersion of the pipette in a thermostatically controlled bath with transparent walls. The methods of viscosity determination as developed by this laboratory are being widely accepted everywhere.

The determination of the viscosity index from viscosity at 210 deg. Fahr. and at 100 deg. Fahr. is an important element. In this laboratory have been developed the gravity index, boiling point index, and optical index, each of which like the viscosity index has a value of about 100 for Pennsylvania oils. The Engler Index is a means of expressing the volatility characteristics of an oil and has been applied mainly to commercial Pennsylvania oils.

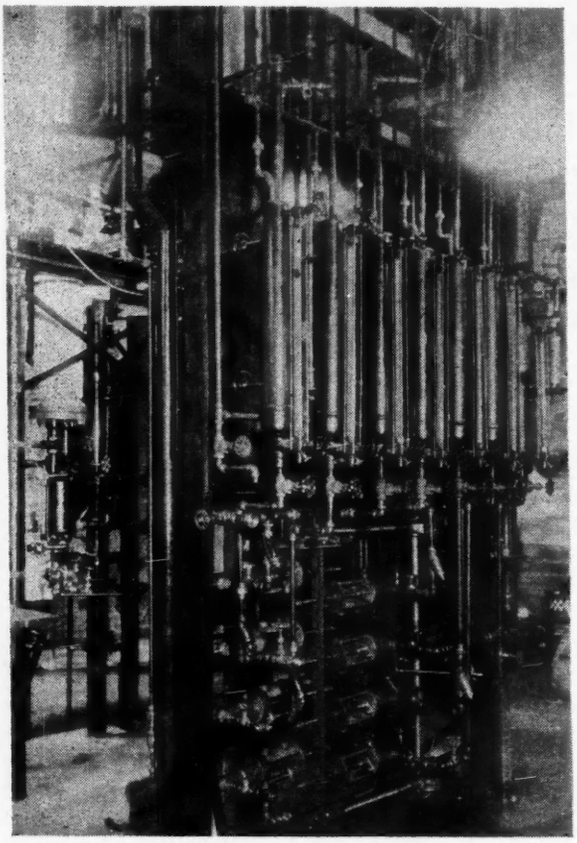
Flash, fire and pour points and other tests are carried out according to the standardized procedures of the American Society for Testing Materials. Although a Saybolt viscosimeter is a part of the equipment, viscosity is almost invariably determined by the more dependable pipettes.

Samples which may be involved in legal proceedings are locked in a large brick vault with walls several feet thick during periods when tests are not actually being run on them.

For analytical purposes, a still operating on charges of a quart to a gallon is used to fractionate oils into a number of cuts. The properties of the cuts allow the history of the past treatment of the oil and its origin to be determined



5. Apparatus for flash distillation of petroleum oils in chemical laboratory.



6. Flexible solvent extraction equipment with base of tower at the left; variable control valves may be seen in the foreground.

in many cases where these would otherwise be obscure. This column is ordinarily operated at a pressure of one mm., the still-pot being in the form of a short cylinder of large diameter to prevent boiling point rise on account of the presence of a thick layer of liquid.

A tower 15 ft. high and 6 in. in diameter operates with a charge of approximately five gal. This device is operated at very low pressure to permit the vaporization of fairly heavy lubricating oil fractions.

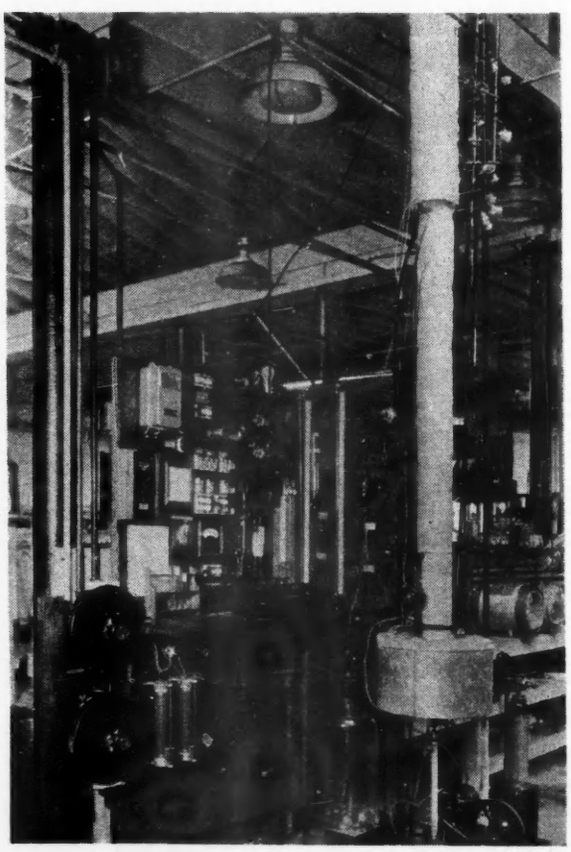
The laboratory also has conducted fundamental research studies on gasoline as part of the program designed to obtain a complete knowledge of the potentialities of Pennsylvania crude. From Pennsylvania gasoline as obtained by distillation from the crude several pure hydrocarbons have been isolated. The gasoline with an end-point of 510 deg. Fahr. was divided first into 261 fractions in a column 27 ft. high, and then certain of these fractions were redistilled in a column 52 ft. high with a 30-40 to 1 reflux ratio to give hydro-carbons equal in purity to those prepared by synthesis.

The chemical and physical nature of straight-run Pennsylvania gasoline also has been investigated. The improvement of this product by procedures such as distillation, cracking, and partial oxidation has received attention.

Knock ratings of various fractions of a Bradford, Pennsylvania crude were investigated. First, a simple batch distillation gave 39 per cent of the crude as a product with an end point of 510 deg. Fahr. This primary product was separated in a single fractionation into cuts which alternated between high and low knock ratings. It was found that this alternation was due to the concentration of straight-chain paraffin hydrocarbons in one fraction, and of aromatic and naphthenic hydrocarbons in the next higher-boiling cut. Any one normal paraffin is present in straight-run Pennsylvania gasoline to the extent of 2 to 5 per cent, and though the aggregate amount of all the normal paraffins is small, it is largely responsible for the low knock rating.

More recent work on a West Virginia naturial gasoline has yielded on one distillation pure 2-methylpentane and n-hexane 95 per cent pure. Individual fractions with octane numbers as high as 89 have been obtained. Blends of these fractions have been made having not only high octane numbers but high tetraethyl lead susceptibility. Fuels of this nature satisfy all the requirements for high octane number aviation fuels.

In this work on distillation of gasoline and lubricating oil, it is obvious that a thorough study of distillation theory and technique was required. An interesting development, made possible only by this extensive and intensive investigation, was the application of a



7. For identification of Pennsylvania oils, the laboratory uses the tower and auxiliary equipment shown here. This arrangement provides a high-vacuum, analytical fractionation of lubricating oil.

distillation procedure to the concentration of heavy water from ordinary water in which it occurs to the extent of about one part in five thousand.

Summary—

While this article is intended to be purely an objective study of an activity having direct automotive interest, the following conclusions may be fairly drawn from an observation of the Association's work:

1. That the Pennsylvania Grade Crude Oil Association has established minimum specifications on the products marketed by licensees authorized to use its official emblem.

2. That the Association has established research and inspection facilities under the supervision of Pennsylvania State College, lending an authoritative and scientific charcter to its findings and publications.

3. That the Association provides a medium for contact with the manufacturers and users of transportation units, thus affording an opportunity not only of studying the behavior of the product in service but of trouble-shooting in the field and an anticipation of future requirements.

4. Finally, that this set-up presents an invaluable contribution to consumer research and consumer protection.

DETONATION

is discussed by G. D. Boerlage in a paper that gives the results of some interesting tests.

SOME further research work intended to throw light on the nature of detonation is described in an article in *Enginering* by G. D. Boerlage and his associates at the Bataafsche Petroleum Co.'s laboratory in Delft, Holland. They point out that rather different noises are produced under detonating conditions by the two most widely used fuel-testing engines. The Ricardo E35 engine, used largely abroad, produces mainly the "ping" type of detonation noise, while the C.F.R. engine produces a noise that is best described as a knock. Tests were made on a single-cylinder L-head fuel-test engine of 3.86-in. bore and 4.25-in. stroke. The combustion chamber was provided with nine spark-plug holes which could be used also for the pressure element of a piezo-electric indicator. Tests were made at 1000 r.p.m. with frequent heavy detonation induced by early ignition and the use of low-octane-number fuel. The pressure elements of the indicator were moved from point to point. They had a frequency of over 50,000 cycles per second, so their natural vibration could not influence the records obtained measurably. With the spark plug in its original position, pressure waves were recorded when the engine was detonating badly, these pressure waves occurring near the end of the combustion period, and they were found to be most of maximum amplitude in a position in the transverse center line of the combustion chamber on the wall opposite the spark plug.

It was found that in this test engine, even under conditions of heavy pinging, there is no indication of a local initial excessive pressure rise at the point where detonation occurs. Such an excessive initial pressure rise therefore does not seem to be essential to detonation. The conclusion of previous investigators that detonation, causing a pressure disturbance, may cause a stationary wave throughout the gas mass, was confirmed. The amplitude of these waves depends on the severity of the detonation, the shape and size of the combustion chamber, and the point of observation. The distribution of the wave amplitudes may be such as to cause the peak pressure to occur outside of the region where the final portion of the charge to burn ignites spontaneously, and the authors suggest that in studying detonation three typical regions should be considered, viz., (a) the actual detonation corner or corners where the last part of the gas burns, (b) the corner or corners where the vibrating pressure effect occurs, and (c) the corner or corners where the highest heat flow to the walls occurs.—*Engineering.*

THICKNESS

of electrolytic deposits may be determined by a modification of the droplet method that is applicable to copper and bronze.

THE droplet method for the determination of the thickness of electrolytic deposits, proposed in 1933, has so far been used only for deposits of cadmium and zinc on steel. It has now been modified so as to make it applicable to deposits of nickel, copper and bronze. In the modification, described by S. G. Clarke, a jet of some corrosive reagent is thrown on the surface of the deposit. Automatic projection of the jet obviates the need for regulating the velocity of flow and permits of defining the point of penetration with more precision. The velocity of penetration also increases, which is of considerable importance in the case of metals having considerable resistance to corrosive attack, such as nickel and chromium. Coatings of the usual thickness require from one to two minutes for their perforation. The equipment and the process are the subject of a British patent, and the apparatus and solutions for use with it will be on the market before long. For nickel deposits use will be made of a corrosive solution containing 150 grams of ferric chloride, 100 grams of copper sulphate crystals, and 250 cu. cm. of glacial acetic acid per liter. The paper by Clarke gives details with respect to determining the exact end of the test. The times required for perforating coatings of known thickness were determined experimentally, for temperatures ranging from 10 to 40 deg. C. Curves obtained for each of the corrosive solutions permit of quickly calculating the thickness of the coating from the time necessary to perforate it at a given temperature.—*Chimie & Industrie.*

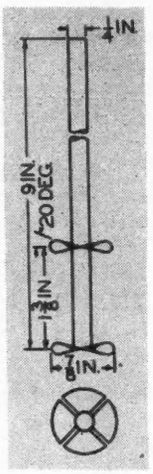


Fig. 2—Special Stirrer Used in Aeration Operation.

AN S.A.E. Recommended Practice for gear oils specifies viscosity ranges for five different grades identified by "viscosity numbers," and gives the Fahrenheit temperature at which each of the grades "must not channel in service." Just how it is to be determined whether or not a given lubricant will or will not channel at the specified temperature is not stated. What is needed particularly is a laboratory test for channeling characteristics. The pour point has been used by some for this purpose, and a number of special tests have been suggested, yet industry at large has had to depend upon service experience or upon tests in full-size axles.

This led the Research and Development Division of Socony-Vacuum Oil Co., Inc., to take up the problem, and a paper on the experimental work done and in which a definite method of test for channel point of gear lubricants is proposed, was presented to the A.S.T.M. at its New York meeting by J. P. Stewart of the Socony research organization. The first prerequisite of a laboratory channel test is correlation with oil performance in axles. Therefore, axle channel tests at low temperatures formed the first step in the development of the test. In the axle tests the channeling temperature was taken as that temperature at which 40 per cent of the oil was in circulation after 10 minutes of operation.

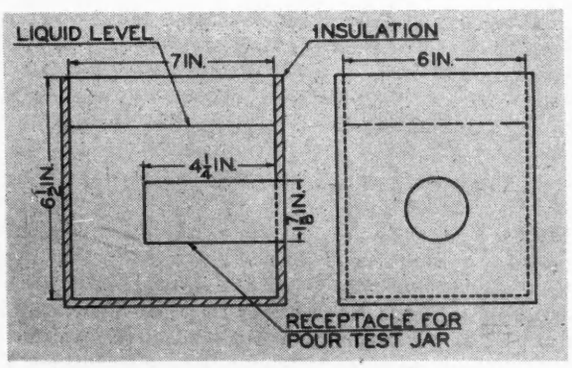


Fig. 1 — Horizontal Constant-Temperature Bath to Maintain Constant Sample Temperature During 1-Min. Observation Period.

Channeling was found to be most severe at the lower speeds, and most of the work was done at an axle speed equivalent to 20 m.p.h. car speed. It was found also that the temperature reached during operation had a profound effect upon distribution after rechilling, due to an air-oil emulsion which persisted during the rechilling period. Under such conditions, channeling temperatures varied between 20 deg. F. below and above the A.S.T.M. pour-point.

On the basis of these axle-test data the following laboratory test was developed, which was found to give reasonable correlation with the observed performance of the oils in the axles. The test employs standard A.S.T.M. pour-point equipment, with the addition of a special stirring apparatus which reproduces the aerating action of the rotating axle gears.

Proposed Method

1. The channel point of a gear lubricant is the lowest temperature at which the oil will flow when it is chilled without disturbance after aeration under definite prescribed conditions.

2. The test jar shall conform to the requirements of A.S.T.M. Standard Method of Test for Cloud and Pour Points (D 97-34).

3. The thermometer shall conform to the requirements of A.S.T.M. Method D 97.

4. The cork shall fit the test jar, and shall be bored centrally to take the test thermometer and stirrer.

5. The jacket shall conform to the requirements of A.S.T.M. Method D 97.

6. A disk cork or felt ¼ in. thick and of the same diameter as the inside of the jacket will be required.

7. The ring gasket shall conform to the requirements of A.S.T.M. Method D 97.

8. The cooling bath shall conform to the requirements of A.S.T.M. Method D 97. For determination of channel points below 50 F., two or more baths should be at hand. The required bath temperatures may be maintained by refrigeration if available, otherwise by suitable freezing mixtures.

9. A horizontal bath with the same

When An Oil Will Channel

jacket as described in item 5 shall be provided to maintain oil temperature during flow observation (see Fig. 1).

10. The stirrer consists of a double propeller attached to a ¼-in. rod 9 in. long, and shall conform to the dimensions given in Fig. 2.

11. A 1-16-hp. 1800-r.p.m. motor with suitable stand, base and clamp shall be provided to drive the stirrer, as illustrated in Fig. 3.

12. Pour the oil into two test jars to a height of not less than 2 in. nor more than 2¼ in. One test jar shall then be tightly corked, carrying the thermometer in a vertical position in the center of the jar, with the thermometer bulb immersed so that the beginning of the capillary shall be ⅛ in. below the surface of the oil. The other test jar shall be tightly corked, this cork carrying the stirring rod immersed in the oil in a vertical position such that the bottom vanes of the stirring rod rest on the bottom of the jar. The top vanes of the stirring rod will then be approximately ½ in. below the surface of the oil.

The two samples are then heated without stirring to a temperature of 115 F. in a bath maintained at a temperature not greater than 118 F. The oil shall then be cooled to 90 F. in air or in a water bath, approximately 77 F. in temperature. Oils on which a pour point below —30 F. is expected shall be heated as above with the high-pour-test thermometer in position, cooled to 60 F. and the low-pour-test thermometer placed in position and the assembly placed in the cooling jacket.

The two test jars are then inserted in the jacket which is surrounded with a liquid at a temperature of 30 to 35 F. Not more than 1 in. of the jacket shall project out of the cooling medium.

Beginning at a temperature of 20 deg. Fahr. above the expected pour point, at each thermometer reading which is a multiple of 5 deg. Fahr., the test jar containing the thermometer shall be removed carefully from the jacket and shall be tilted just enough to ascertain whether there is a movement of the oil in the test jar. The complete operation of removal and replacement shall not require more than 3 sec. The sample jar containing the stirrer is not removed from the jacket when inspecting the oil for movement. If the oil has not ceased to flow when its temperature has reached 50 F. both test jars are placed in a second bath maintained at 0 to 5 F. If the oil has not ceased to flow when the temperature has reached 20 F. both test jars are removed to a bath at —30 to —25 F. At —10 F. should the oil still be flowing both test jars are inserted in a bath at —60 F. At no time shall the cold test jar be placed directly in the cooling medium. As soon as the oil in the one test jar does not flow when the jar is tilted, the test jar shall be held in a horizontal position for exactly 5 sec. as noted by a stop watch or other accurate timing device and observed carefully. If the oil shows any movement in the test jar under these conditions, the test jar shall be immediately replaced in the jacket and a test for flow repeated at the next temperature 5 deg. Fahr. lower.

The test shall be continued in this manner until a point is reached at which the oil in the test jar shows no movement when the test jar is held in a horizontal position for 5 sec. During the above inspections the test jar containing the stirrer has not been dis-

(Turn to page 159, please)

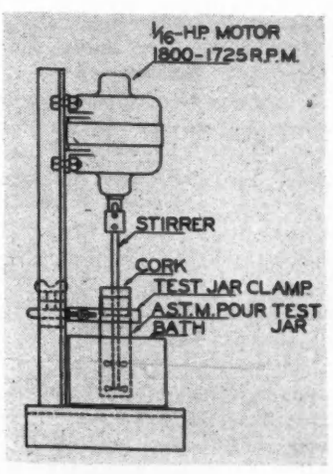
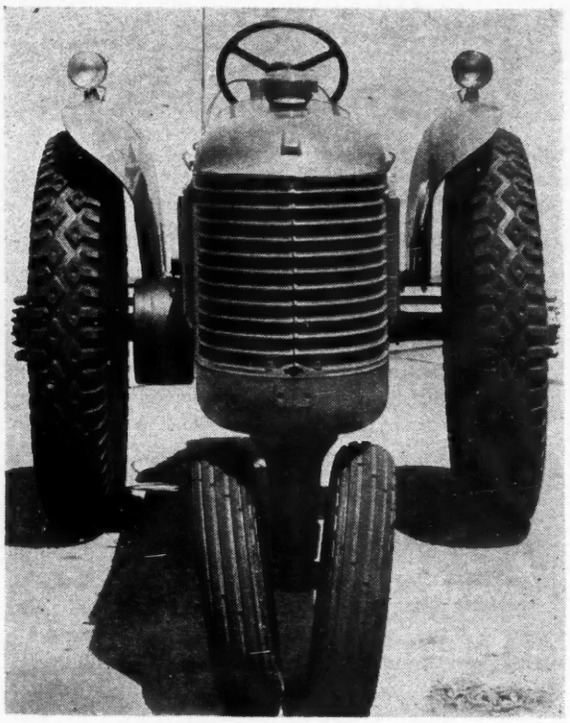


Fig. 3—Stirring set-up. Showing Sample in Position for Aeration Operation.



Head-on view of tractor showing clean lines and narrow shoulder profile for maximum visibility

The Graham-Bradley Farm Tractor Described

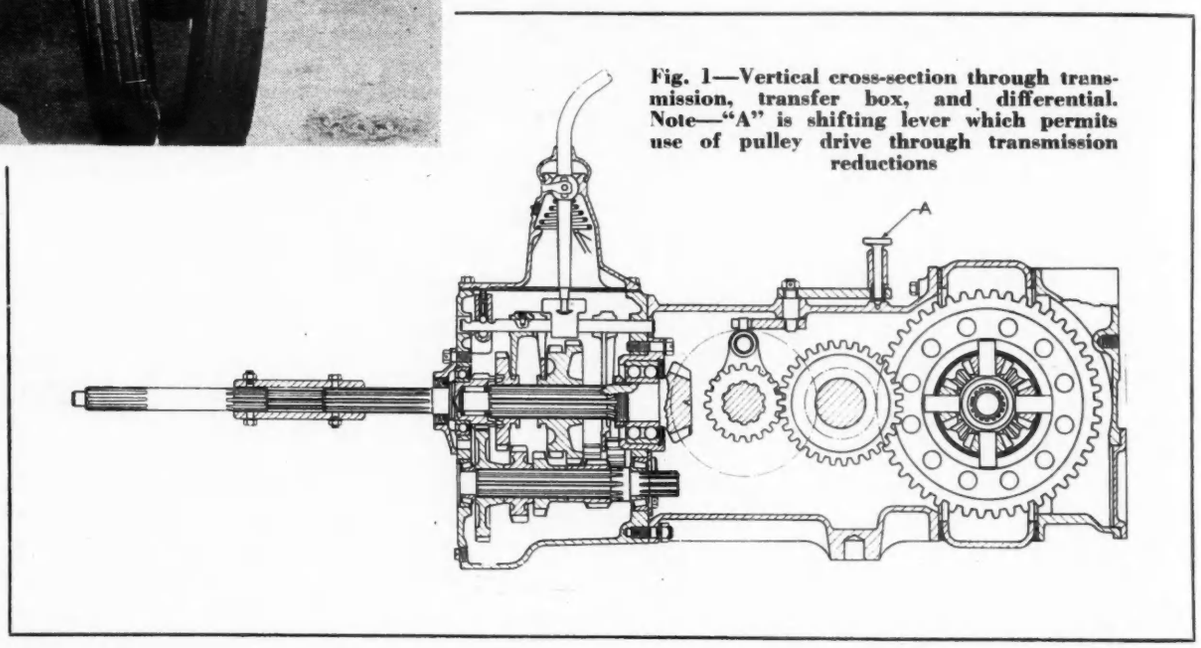


Fig. 1—Vertical cross-section through transmission, transfer box, and differential. Note—"A" is shifting lever which permits use of pulley drive through transmission reductions

THE very essence of automotive engineering design has been incorporated in the Graham-Bradley farm tractor which is being produced by Graham-Paige for the Sears-Roebuck sales organization.

The machine is designed for maximum visibility for all manner of farm work and is completely sealed and enclosed as to mechanism to prevent the entry of dust, dirt, and water. It weighs 3600 lb. and is recommended for use with 2-3, 14-in. plows. Drawbar horse power is 25 hp. approximately; belt power is 30 hp. approx. With engine under governor control, the tractor has a speed of 20 m.p.h. in fourth gear.

With a wheelbase of 90 in. and rear tread adjustable from 56-84 in., the tractor has a turning radius of 96 in.

The engine is built up from basic elements of the Graham-Paige engine, with certain modifications and attachments required for tractor service. The engine is a 6-cyl. L-head, 3¼ in. bore by 4 in. stroke, 199 cu. in. displacement. The compression ratio is 5.9 to 1. Fitted with a cast iron head, the engine is governed to a full-load speed of 1400 r.p.m., developing 35 bhp. at that speed. Valves, pistons, connecting rods, block, and bearings are the same as on the standard engine. The camshaft is special for this application.

Full protection against conditions encountered in farm service is offered by the installation of a Donaldson air cleaner and Fram oil filter. A Burgess straight-through muffler is standard. Delco-Remy starter, generator, and ignition distributor with automatic advance are used, the generator having current regulation. Battery is the Cross-Country, Sears-Roebuck, with 15 plates per cell and rated 91 amp.-hrs. capacity. Spark plugs are 18 mm. with 0.024 in. gap.

Engine speed is controlled by a Handy centrifugal governor mounted on the right-hand side off the timing gear case. It is direct-connected to the updraft Marvel-Schebler carburetor and has manual selection of governed speeds.

The drive units are of automotive design, comprising a special four-speed transmission with sliding spur gears; a transfer box with heavy spur gear train;

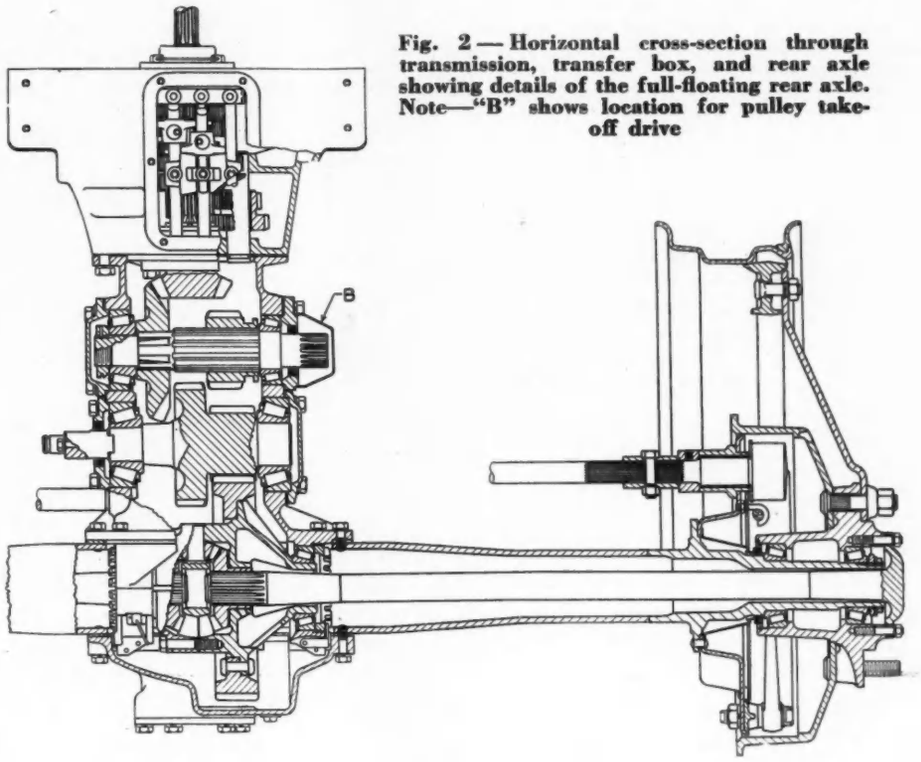


Fig. 2 — Horizontal cross-section through transmission, transfer box, and rear axle showing details of the full-floating rear axle. Note—"B" shows location for pulley take-off drive

Mechanical Details of the Graham-Bradley Tractor

General Specifications

Wheelbase	90 in.
Length	132 in.
Width	74 in.
Height	60 in.
Shipping weight	3600 lb.
Turning radius	8 ft.

Engine

No. of cylinders	6
Bore	3.25 in
Stroke	4.0 in.
Compression ratio	5.75 to 1
Horsepower at r.p.m.	35 at 1400 r.p.m.
Valve arrangement	L
Cylinder head-type	Iron
Piston displacement	99 cu. in.
Number of main bearings	4

Hp. Rating

Belt	29 hp.
Drawbar	22 hp.

Power Take-off

Speed at 1400 r.p.m.	607

Tractor Speeds

First	2.8 m.p.h.
Second	4.4 m.p.h.
Third	6.2 m.p.h.
Fourth	20.0 m.p.h.
Reverse	2.25 m.p.h.

Wheels

Diameter—front	16 in.
Width—rear	4 in.
Diameter—rear	36 in.
Width—front	6 in.

Tires

Rear	36 by 9.00
Front	16 by 5.50

Ignition make	Delco Remy
Carburetor	up-draft balanced type
Lubrication	pressure to main bearings, connecting rod bearings, camshaft bearings, timing chain, pistons
Clutch	Long truck type; single dry plate; 9.5 in. diam.
Transmission	sliding spur gears
Belt pulley	diameter, 14 in.; face width, 7.25 in.; normal r.p.m., 1400
Steering type	Ross cam and lever
Brakes	Timken heavy-duty; drums, 16 in. diam.

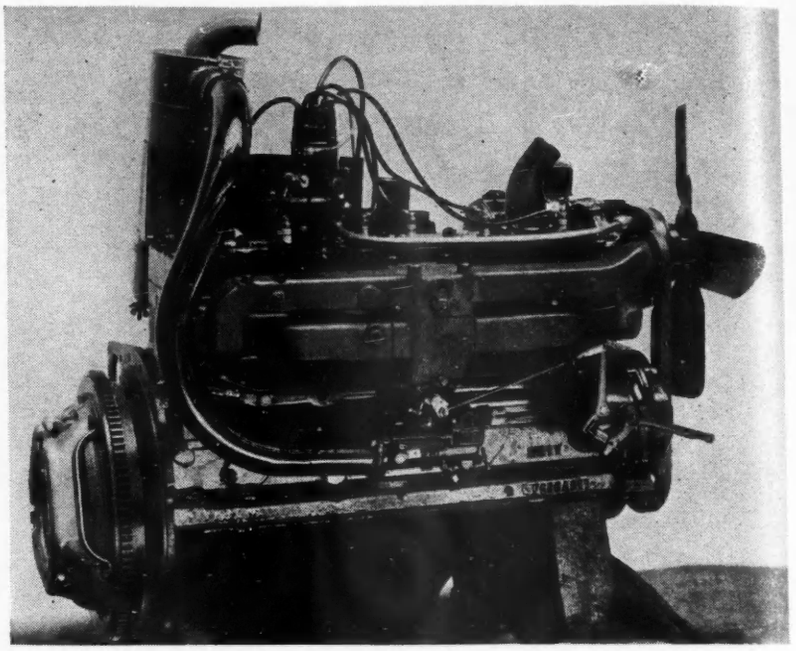
and a full-floating, heavy-duty rear axle of Timken design. A Long truck-type clutch is used—9½ in. diameter, single dry plate. Truck type Timken heavy-duty internal enclosed brakes are standard.

Ross cam-and-lever steering gear with a 17-in. wheel is provided. A special step-up gearing is used at the front end to produce a displacement of 135 deg. at the front steering wheels.

High grade nickel-alloy steels are used throughout for gears and shafts in the transmission and driving mechanism. The backbone frame is a light but torsionally strong and rigid unit made of light, ribbed, cast sections of nickel-alloy iron.

As may be seen in Fig. (2), an unusual feature of the transfer case is the provision of an intermediate pulley take-off drive directly off the rear end of the transmission, making it possible to drive the pulley at four different speeds. The pulley countershaft is engaged by means of the lever "A" shown in Fig. (1), while the pulley drive may be thrown on or off, after engagement, by means of an external lever at the operator's station. Both ends of the pulley countershaft are provided with the new Barber-Colman taper splines to assure lifelong freedom from loosening or end-play.

An important feature of the tractor



Exposed view of Graham-Paige Cavalier engine with special attachments required for tractor work. Side view shows the Handy governor at the front and the up-draft Marvel-Schebler carburetor with special manifolding; on the other side—the Donaldson air cleaner and Fram oil filter

is the use of anti-friction bearings throughout the mechanism. Ball bearings are used in the transmission, while Timken roller bearings are found at every point in the transfer case, take-off, and rear axle.

The rear axle is of Timken heavy-duty truck design with modifications to suit the tractor design. Brakes are selectively controlled by means of two pedals at the controls, one for each brake, although both brakes may be set simultaneously by depressing both adjacent pedals simultaneously.

AUTOMOTIVE ABSTRACTS

Motor Fuel from Coal

THE problem of the production of motor fuels from domestic raw materials is once more strongly to the fore in all of the larger European countries, and in England, France and Germany the raw material now principally considered is coal. In France a series of two lectures on the synthetic production of motor fuel from coal in that country was recently given under the joint auspices of the Society for the Encouragement of National Industry and the Association of French Petroleum Technologists. The first of these lectures was by Ferdinand Valette, chief engineer of works of the Bethune Mining Co., while the second was by Etienne Audibert, director of the National Society for Fuel Treatment Research.

It developed from these two lectures that 50 tons of coal are being treated per day for the production of motor fuel at each of two hydrogenation plants, at Bethune and at Lievin. Different processes are being used at the two plants and both are of French origin. As regards the Valette process, worked at Bethune, it is stated that it yields a gasoline which differs materially from the petroleum product in its physical properties. It is composed chiefly of aromatic hydrocarbons (similar to those in benzol) and is of much higher density than ordinary gasoline, its specific gravity being approximately 0.84. Only the lower members of the aliphatic series of hydrocarbons are present, and the product contains none of the aliphatic hydrocarbons present in kerosene and lubricating oil distilled from petroleum. The anti-detonating value is quite satisfactory, the octane number ranging between 76 and 82. The heat value of the product is about 20,700 B.t.u. per lb. An additional advantage of the synthetic product is that it mixes with ethyl alcohol much better than petroleum gasoline.

Operations at Lievin were covered in the lecture by M. Audibert. There two grades of gasoline are being produced, one-fifth of the total product being produced in the vapor phase and four-fifths in the liquid phase. The compositions of these two fuels are as follows:

	Liquid Phase	Vapor Phase
Ethylene hydrocarbons	12 per cent	.....
Aromatic hydrocarbons	40	55–70
Saturated hydrocarbons	48	45–30
Sulfur	0.1	0.02
Gum (milligrams per liter)	25	5
Octane number	60	70–85

For the production of one ton of gasoline, one and a half tons of coal, 55,000 cu. ft. of hydrogen, and 640 kilowatt-hours of energy are required. Production of this ton of synthetic motor fuel is accompanied by the production of 880 lb. of gaseous hydrocarbons containing 35,000 cu. ft. of hydrogen. When treated with steam, these gases will yield 70,000 cu. ft. of hydrogen or more than required for the process in the first place. This is claimed to be a great advantage of the process, as the cost of the hydrogen is an important item in the operating cost.—Le Genie Civil.

Ignition Temperatures

DETERMINATIONS of the ignition temperatures of various hydrocarbons have been made by H. Brueckner and R. Schoeneberger and were reported by them in *Brennstoff-Chemie*. The hydrocarbons studied included commercial propane and butane, pentane, hexane and normal heptane, and chemically pure benzine, toluene and cyclohexane.

Temperatures of ignition were determined for different concentrations of the fuel in the mixture (different mixture ratios) with both air and oxygen. The ignition temperatures of theoretically correct mixtures were found to be as follows: Propane, 1180 deg. F.; butane, 1139 deg.; pentane, 1196 deg.; hexane, 1143 deg.; heptane, 1026 deg.; benzene, 1304 deg.; toluene, 1218 deg.; cyclohexane, 1089 deg. The lowest temperatures of ignition (which correspond to an excess of fuel in the mixture) are as follows for the different fuels: Propane, 1087 deg.; butane, 1107 deg.; pentane, 986 deg.; heptane, 1002 deg.; benzene, 1283 deg.; toluene, 1216 deg.; cyclohexane, 916 deg. (These ignition temperatures refer, of course, to ignition under atmospheric pressure; under higher pressures the ignition temperatures are materially reduced—Editor.)—*Chimie & Industrie.*

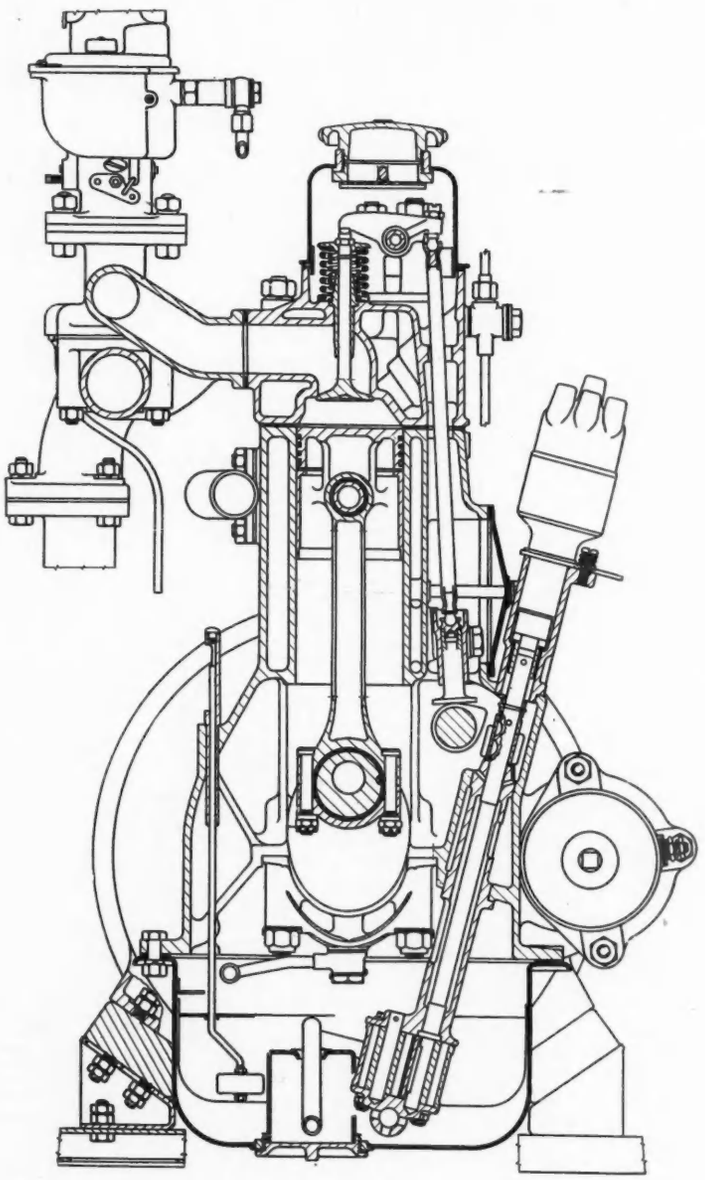
HOTCHKISS . . . . . .

This six-cylinder passenger car engine is made by the Societe Anonyme des Anciens Etablissements Hotchkiss & Cie., Saint Denis, France. Specification data of the model 680 shown here are given on the succeeding page.

No. 36 in the AUTOMOTIVE INDUSTRIES Series of Engineering Drawings

Hotchkiss . . . . .

The Hotchkiss, model 680, 6-cylinder passenger car engine reproduced herewith has bore and stroke dimensions of 80 mm. (3.15 in.) by 100 mm. (3.94 in.), respectively. Piston displacement totals 3016 cc. (184 cu. in.). Horsepower developed is 88 at 3800 r.p.m. Torque rating is 18.6 kg.-m. (135 lb.-ft.) at 2000 r.p.m. Compression ratio is 5.9 to 1. The cylinder head is of cast iron; pistons are Novo aluminum alloy with steel struts. There are seven crankshaft bearings; bearing diameter being 56 mm. (2.2 in.), total bearing length 253 mm. (9.95 in.)



When An Oil Will Channel

(Continued from page 153)

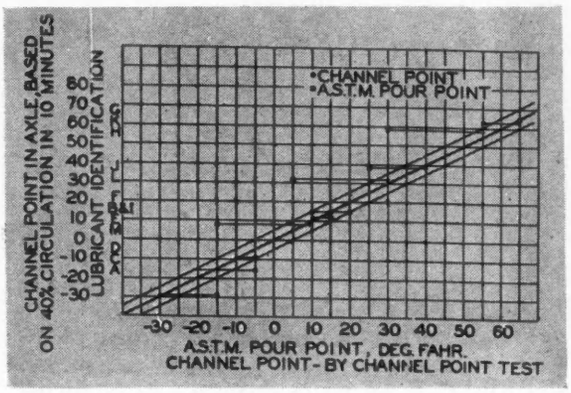


Fig. 4—Correlation Between Channel-Point Temperatures by Channel-Point Test and in Axle.

turbed with the exception of transferring the jar from one bath to another. As the oil in this jar has been subjected to the same temperature conditions as that in the jar on which the pour was determined, it is reasonable to assume the oil temperatures are the same. The purpose of using two test jars is to prevent condensation from forming on the surface of the oil in the test jar, thereby giving erroneous results, should the thermometer and stopper be removed for the insertion of the stirring rod.

13. The second test jar which is now at the cold point of the oil and which contains the stirring rod is removed from the low-temperature bath and placed in the stirring bath at 55 F. The stirrer stem is inserted in the coupling attached to the stirring motor. The test jar is clamped in a position such that the bottom vanes of the stirring rod are approximately ⅛ in. above the bottom of the jar. The top vanes, being 1⅜ in. above the bottom vanes, are about ¼ in. below the surface of the oil. The motor is started and run for a period of 20 min., the stirring bath temperature being held at 55 F. As the oil becomes aerated, in light-colored oils a very definite yellow air-oil emulsion is in evidence. On the black oils the air-oil emulsion does not change the color of the oil, but very small air bubbles cause the oil to foam. During the 20 min. of stirring the oil temperature shall not rise above 70 F. (bath temperature should be lowered if necessary). The test jar is now removed from the stirring apparatus, stirring rod removed and the pour test thermometer carrying the test-jar cork inserted in the jar.

14. The test jar is now replaced in the 30 F. cooling bath. The standard cooling procedure of Section 10 of Method D 97[5] is followed down to the cold point of the aerated oil, except that the final flow observation shall be made over a period of 1 min. During this observation the test jar is placed in the horizontal bath, which should be held at cold-point temperature, to prevent warming of the oil by atmospheric heat. Inspection for flow will be made at 30 sec. and exactly 60 sec. Should movement of the oil be noted at either the 30-sec. or 1-min. point, the test jar shall be immediately replaced in its correct low-temperature bath and chilled another 5 deg. Fahr. This procedure shall be followed until no motion is noted during the 1-min. period the test jar is in the horizontal bath. The reading of the test thermometer at this temperature, corrected for error if necessary, shall be recorded. The channel point shall be taken as the temperature 5 deg. Fahr. above this solid point.

Fig. 4 shows the correlation between the result obtained by the proposed laboratory method and in the axle, with 12 different oils, and the A.S.T.M. pour points are also plotted.

Tires of Synthetic Rubber Tested in Germany

LARGE-SCALE road and track tests with pneumatic tires made of synthetic rubber are being carried out by the Ordnance Department of the German Army, and a paper on the subject was read before the Automobile- and Aero-technical Society at its recent annual meeting by Lieut. Dipl.-Ing. Philipps.

Some work on synthetic rubber was done in Germany before and during the World War. After the war the subject was dropped, because it was evident that at the then current prices of natural rubber the synthetic product had no chance. Development work was resumed by the I. G. Dye Industry Co. in 1926, when natural rubber sold at 5-7 marks per kilogram (as compared with 0.30 mark in 1933), which made the commercial prospects of synthetic rubber seem rather bright. The first tests with synthetic tires were made on the Nürburg Ring race track in 1928.

A strong impetus was given the enterprise in 1935, after the decision of the German Government to rearm. It was then decreed by the Minister of War that the Ordnance Department should undertake large-scale experiments with the object of assuring a supply of replacement tires on the synthetic basis, that it should take over, at cost, the entire output of plants equipped for quantity production, and that all tire requirements of the Army should be met with Buna tires if available (Buna being the trade name of the German synthetic rubber). All German tire factories are now commissioned to manufacture tires of synthetic rubber.

A number of different synthetic rubbers have been developed by the I. G. combine (usually referred to as the Dye Trust). One of these is known as Number Buna, the word "number" referring to the degree of polymerization of the butadiene, a hydrocarbon gas which is an intermediate product in the production of the synthetic rubber. The process of making the rubber consists essentially of the following steps: Coal

(Turn to page 163, please)

Immersion heating of pickle tanks with gas burner firing into lead coils submerged in the acid bath. Lead lined wooden tanks are employed.

HOT solution tanks are universally employed in industry. Especially is this true in product cleaning, since few products will take a finish unless the dirt, grease and foreign matter acquired in manufacture is first removed. Practically every metal product factory is equipped with one or more hot solution cleaning tanks, and many have dozens. While most of these are used for dipping, many are part of automatic cleaning and drying machines equipped with traveling conveyors. These machines are so designed as to speeds and capacities that they become machine tools and are synchronized with other machines in the production line. In any case, the speed and flexibility of heating are most important. Pickling tanks and plating tanks come next in order of use.

Gas immersion is the modern, economical way of heating hot solution tanks. It is new, ingenious, simple and efficient. Formerly steam or underfiring with gas was employed. Gas immersion heating for the tanks is considered cheaper and faster to operate and more economical to install. It is a decided improvement over gas underfiring. In the first place, sediment deposition materially reduced heat transfer, and subsequent overheating causes the tank bottom to break down rapidly. The immersion tubes or coils are spaced above the bottom so as not to be effected by this factor. Secondly, the bottom can be insulated, as well as the sides, which cuts heat losses and fuel consumption and makes things much more comfortable for the operator.

As compared with steam heat from a central power plant or heating system, higher overall efficiencies are obtained with gas immersion. The investment cost is much smaller than the installation of steam pipes, condensate returns, collecting tanks, steam traps, pressure controls, etc. Flexibility is obtained with a battery of gas immersion units, as the number in use can be quickly increased or decreased to meet fluctuating production schedules. Wooden tanks can be heated with gas immersion coils but not by underfiring. Common iron and steel pipes are satisfactory with ordinary cleaning solutions. Lead coils are used with acid tanks (pickling, electro plating, etc.).

Immersion coils are made up of standard pipe with standard fittings. They are laid horizontally and close to the bottom of the tank, with one end welded to a hole in one side of the tank. A gas burner is clamped to the outside of the tank, in such a position as to fire through this hole and into the coil. To the other end of the coil is attached an upright piece of pipe to act as a flue. Either atmospheric or pressure gas burners can be used. Any existing installation can be quickly and easily converted to this method of heating.

Several designs are shown, all of which have proven successful in actual service. The tanks, for the most part, are 3 x 3 x 3 ft. Pipe sizes range well within 3 to 5 in. in diameter. Flue heights vary from 4 to 7 ft. The longer flues provide greater draft and the burning of larger volumes of gas, which results in faster heating. There is considerable latitude as to design and heat input, all resulting in equal efficiencies. While increasing the heating up speed is at the sacrifice of efficiency when operating at holding heat, this efficiency can be restored by turning down the burner.

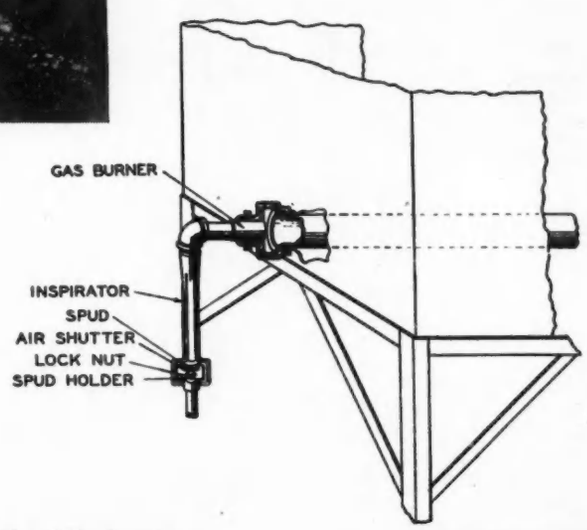
Insulation is desirable but not necessary. Uninsulated tanks operated at 150 deg. Fahr. lose about 180 B.t.u. of

Immersion Heating for Hot Solution Tanks

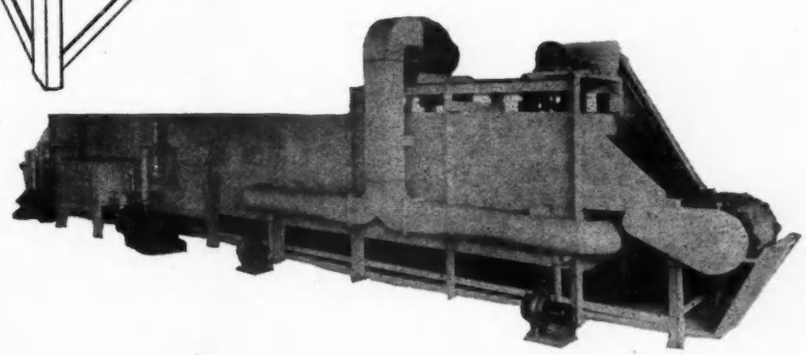
amount to approximately 35 per cent. This with a tank 7 x 4 x 3½ ft.: Rockwool, magnesia or multiple ply asbestos is usually employed. A cover is recommended. Further economies can be obtained by using temperature controls and safety pilots.

When the cleaning process is mechanized, two or more tanks are usually incorporated. A hood covers all and pumps force the liquids, through jets or spray nozzles, against the work as it passes on the conveyor. The liquids run back into the tanks for reheating and reuse. The first tank contains the cleaning solution and the second a rinse. To this setup is attached an enclosed sheet and metal extension, with open gas flame burners, which acts as a drying oven. These units are so designed as to length of oven and temperature as to give a perfect drying job with the fastest conveyor speed commensurate with complete cleaning and rinsing. Waste heat from the flues can be utilized to good effect here. Occasionally increased speed is effected by shortening the oven and applying gas-

(Turn to page 166, please)

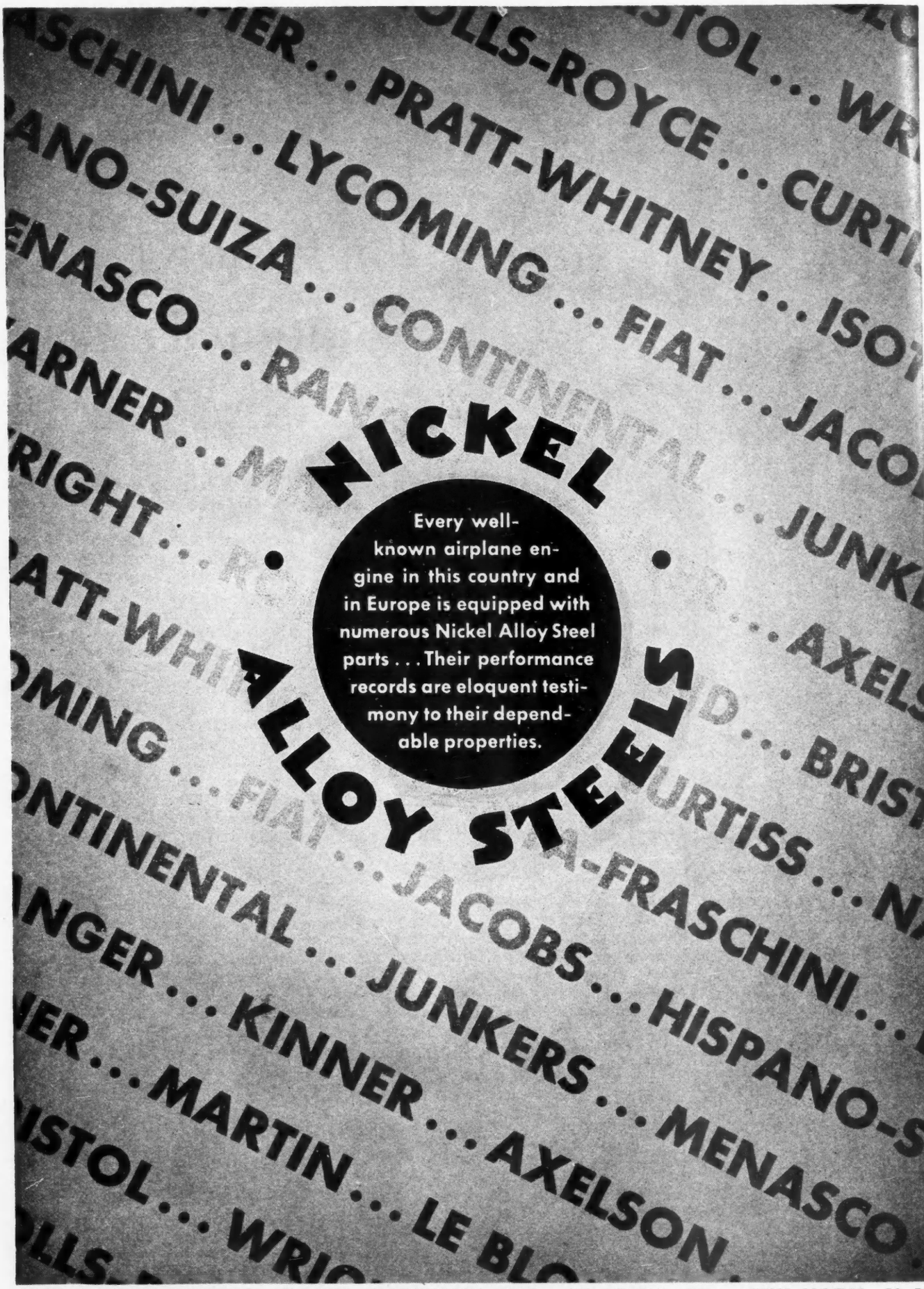


Details of the immersion heat unit.



Automatic and continuous unit combining washing, rinsing and drying. Immersion gas burners heat the solution in the tanks and primus gas burners heat the drying oven.

heat per hour per sq. ft. of wall surface by radiation and convection. The heat loss from the surface of the liquid is at about the same rate, to which must be added the evaporation loss. Tank wall losses can be reduced by 90 per cent with three inches of insulation during the holding periods. The corresponding reduction in gas consumption would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THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

Tires of Synthetic Rubber Tested in Germany

(Continued from page 159)

and lime are converted into calcium carbide in the electric furnace. Carbide combined with water yields acetylene gas. The acetylene is converted into butadiene and the butadiene gas is compressed to liquefy it. The liquid butadiene has a soap solution added to it and is emulsified in water, the butadiene coagulates to rubber, and the latex thus formed settles at the bottom of the container.

In addition to the Number Buna there are two other types or grades, N Buna and S Buna.

Tires of N Buna are said to be 30 per cent (and more) superior to those of natural rubber. They are distinguished by superior solidity, elasticity, and resistance to abrasion. However, this grade is very difficult to work or process. Number Buna is easier to work, but does not have quite as good mechanical properties as natural rubber, especially when used in tire carcasses. S Buna occupies a position approximately midway between the other two grades, with respect to both workability and mechanical properties.

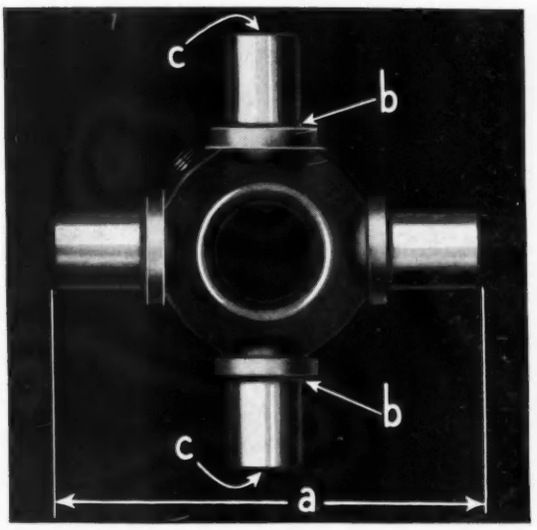
Lieut. Philipps pointed out that, since synthetic rubber was of great importance from the standpoint of national defense, the aim was to produce a rubber of the highest quality, as judged by the serviceability of the tires made of it; that the idea of a mere substitute for natural rubber had been discarded, and that the item of cost was regarded as of secondary importance, for the time being. It appears to be the plan to offer tires of synthetic rubber to the general public in 1938, and cost of production then will become an important factor. The author said no definite figure could be given as yet, but estimates of ten, six and even four times the cost of natural rubber were no longer valid.

Tests on 20 tank trucks were started in April, 1935. In a number of cases there was trouble from loosening of the protectors due to insufficient adhesiveness of the Buna; from the formation of "boils" or blisters in the carcass, and from cracks in the side walls. However, the majority of the tires withstood the tests, which extended over 20,000 km. (12,500 miles). The tire industry was constantly kept informed of the results of the tests, so that the lessons learned could be incorporated in a second series, which were placed in production while the tests with the first series were being continued.

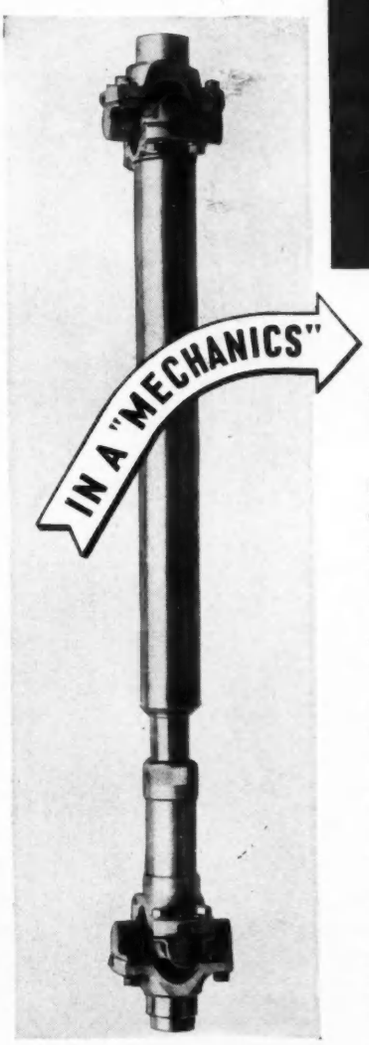
Since last year the tests have been extended to motorcycles, trucks and buses. Tests at high speeds on the new super highways were carried out in collaboration with Daimler-Benz. Up to the present more than 12,000 "synthetic" tires have been accepted by the Army. No inherent defects have been discovered so far; on the contrary, it has been found that the tires will withstand speeds up to 85 m.p.h. and that the rate of abrasion is between 20 and 30 per cent less than with natural rubber.

All synthetic tires have a "B" in red vulcanized in on the side, and are similarly marked on the inside, so they can still be recognized after being worn out. The reason for the latter measure is that old tires of natural and synthetic rubber must not be mixed when attempting to regenerate the rubber.

As regards the two other ingredients of pneumatic tires which had to be imported in the past, lamp black or carbon black is now being produced in Germany, while the supply of cotton is being stretched by admixture with cellulose fiber and in the course of time it is planned to replace cotton entirely with rayon and hemp.—A.T.Z.



MECHANICS



Hard Surfaces Take End Thrust

In Mechanics Roller Bearing Universal Joints end thrust is carried by the hardened and ground journal-ends "c" which bear on the end walls of the roller bearing housings. This design, pioneered by "Mechanics", relieves the narrow shoulders "b" of all pressure and places the thrust loads on the much larger and more durable journal-ends. Grinding surfaces "c" flat, square with the axis, equidistant from the center of the cross, and within close limits on dimension "a" is simple and economical as accomplished by "Mechanics". This promotes perfect balance and smooth running when the joints are installed. Simplicity of design and small number of parts makes installation easy. Integral keys for transmitting torque make operation reliable. These, and other features, are the reasons why Mechanics Roller Bearing Universal Joints are used as original equipment in leading passenger cars, trucks, and busses and are unexcelled for replacement service. Investigate.

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VisControl greatly

VisControl, the new Bethlehem development for the control of steel making, eliminates many of the variables that have caused different heats of steel made to the same specifications to behave differently in processing. Whether you forge, draw, machine or heat-treat steel, production will go along much more smoothly with Bethlehem steels made under VisControl.

VisControl gives the melter a firmer grip on the tool he uses in refining steel—the slag. He can steer the process accurately through the critical final hours of the heat. The difference in accuracy between former processes and VisControl can be compared to the difference between putting a golf ball toward the hole and carrying it to the hole.

y facilitates the processing of steel

The characteristics of steel which determine forging, deep-drawing, machining and heat-treating qualities are largely governed by two factors aside from analysis —grain structure and degree of oxidation in the open-hearth furnace. With VisControl the melter can guide these factors accurately to obtain the desired properties to a high degree and can turn out heat after heat with practically identical processing characteristics.

With VisControlled steels, once you establish a heat-treating cycle, a tool or die set-up, or a forging practice you are all set for production with uniform results.

Practically all Bethlehem steels are now made under VisControl.

In Machining

For easy machining, steels must, when cut, produce chips that curl satisfactorily. Under usual steel-making practice, elements used to overcome oxidation of the steel bath tend to produce so-called gummy steel. With VisControl such additions are minimized because the degree of oxidation is controlled. The result is much more satisfactory steel for machining—giving faster production, better finish and longer tool life.

In Drawing

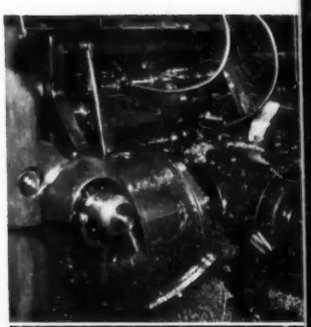
In sheets for die-press operations uniformity of ductility is extremely important. Deep-drawing qualities are greatly influenced by the degree of oxidation of the steel in the open-hearth, and more accurate control of this factor is one of the important features of VisControl. With VisControlled sheets you can set up for operations that make demands close to the limits of the drawing qualities of the sheets with assurance that all sheets will measure up to requirements and go through without trouble.

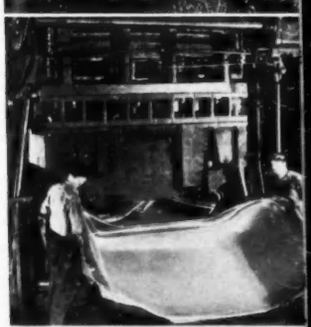
In Heat-Treating

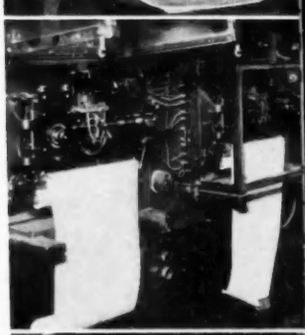
Behavior under heat-treatment is a characteristic that depends largely on grain size. The uniformity of grain structure in heat after heat of VisControlled steels makes it possible to establish a heat-treating cycle that gives the desired results and then adhere to it. Both substantial economies and a better, more uniform product result.

In Forging

Forging qualities are largely dependent on proper deoxidation, which determines the quality of the surface. With steels made under VisControl, deoxidation is accurately controlled through heat after heat. Using VisControlled steel you are all set for long runs without variation in forging practice, without losses from flaws.







BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

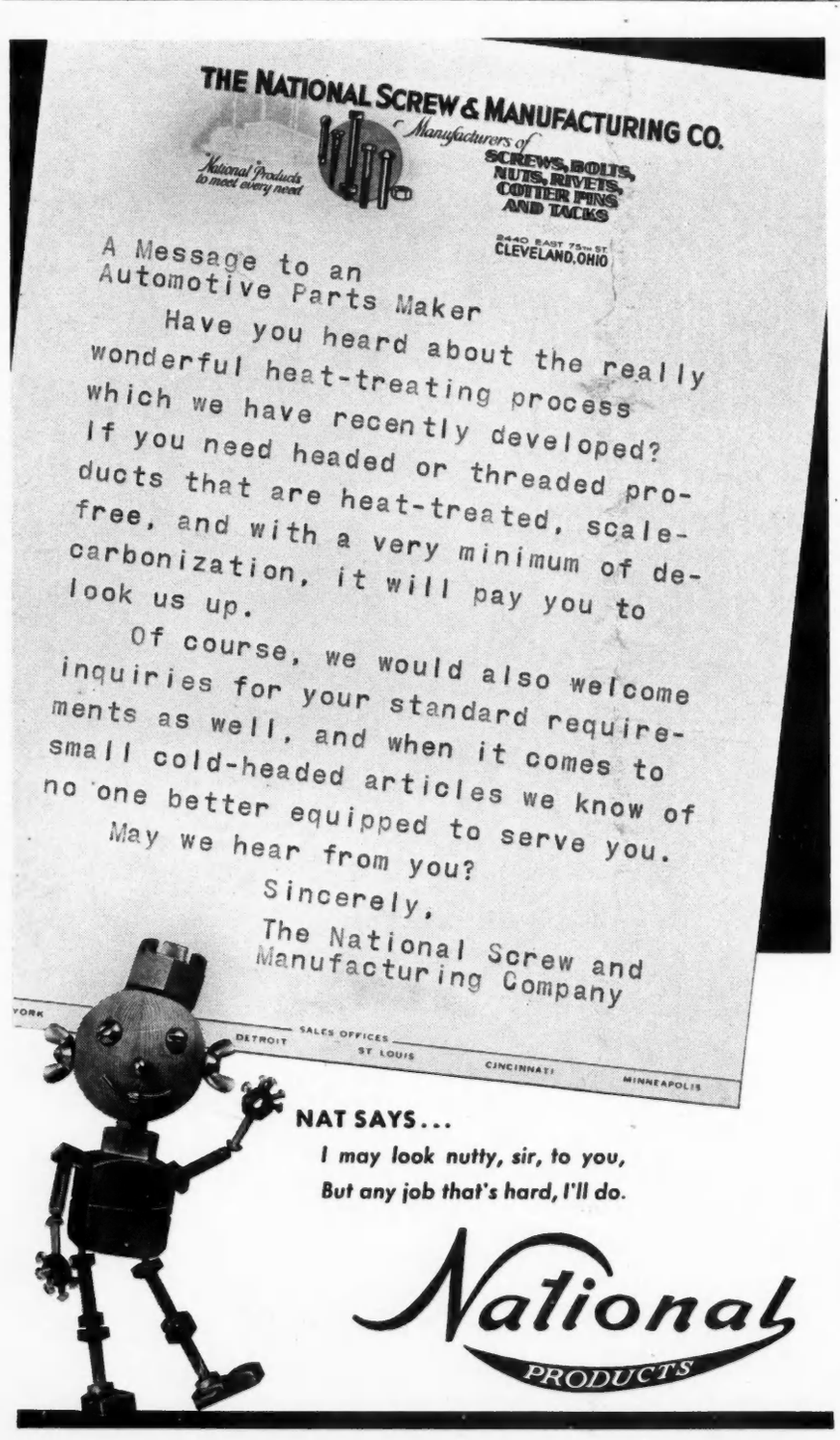
Details of Engine for Private Airplanes Are Discussed

LIGHT aircraft engines, that is, engines intended for airplanes suitable for private ownership and operation, were discussed in an I.A.E. paper by D. R. Pobjoy, chairman and managing director of Pobjoy Airmotors and Aircraft, Ltd. The author first discusses the engine requirements of light aircraft in general and then goes into the detail design of the engines part by part. Considerable space is given to a discussion of ignition, lubrication, carburation and cooling equipment, and to installation.

Mr. Pobjoy at first produced the simplest form of engine and has now reached fully-cowled multi-cylinder engines. He says the average private owner soon finds he wants to fly fast and far; next he demands radio equipment (which calls for fully screened ignition), electric engine starters, engine-driven dynamos, and an air pump to operate blind-flying instruments. All of this is provided in the modern light engine.

Demand for more performance is bringing high-compression engines, stellited valves and inserts, nitrided liners, hydraulic tappets, superchargers, carburetor heat control, etc., still further departing from the original conception of cheap airplanes and low operating costs. Such engines are very suitable for luxurious small twin- and even four-engined planes for operation by the wealthy sportsman or by the small air line.

The author said the Air Ministry was often blamed for the excessive cost of small air engines, but it was his opinion that if that authority were abandoned, manufacturing costs would rise immediately. Air engines were built not to comply with the requirements of the Air Ministry but with those of the medium in which they operate. "Nature cannot be bluffed, and for the breakage of its laws there is no forgiveness." *I. A. E. Journal.*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I may look nutty, sir, to you,
But any job that's hard, I'll do.
National
PRODUCTS

Immersion Heating for Hot Solution Tanks

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air torches manually to finish the drying of the work at the seams.

Immersion tube heating can be applied to pickling and plating tanks, either metal or wood, containing acid. Here lead tubes are employed. Ordinary lead waste pipe with walls ⅛ in. thick and heavier have proved satisfactory. Very economical installations can be made in the case of 500- and 1000-gal. tanks and using reasonably-priced automatic temperature controls with motorized valves, liquid temperature thermostates, safety pilots and gas pressure controls. This procedure renders the installation entirely automatic.

Degreaser and High Pressure Gas

The degreaser is a comparatively new development in cleaning. It utilizes the heated tank to vaporize a cleaning solution. Vapors rising and condensing on the cold work, dissolve the grease and flush the parts free of both dirt and grease. The solvent employed is stable and is said to be many times more effective than gasoline, naphtha and other solvents that cannot be heated or boiled with safety. Here again the gas immersion coil is the ideal way of heating these degreasers.